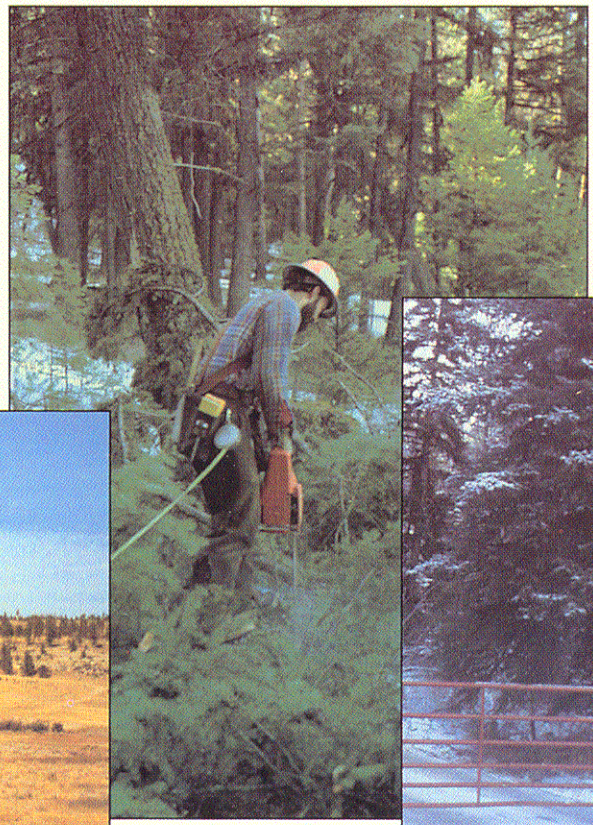
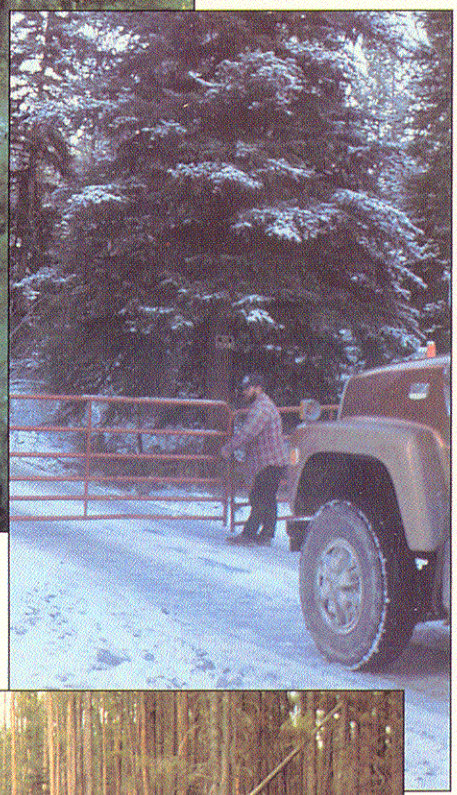
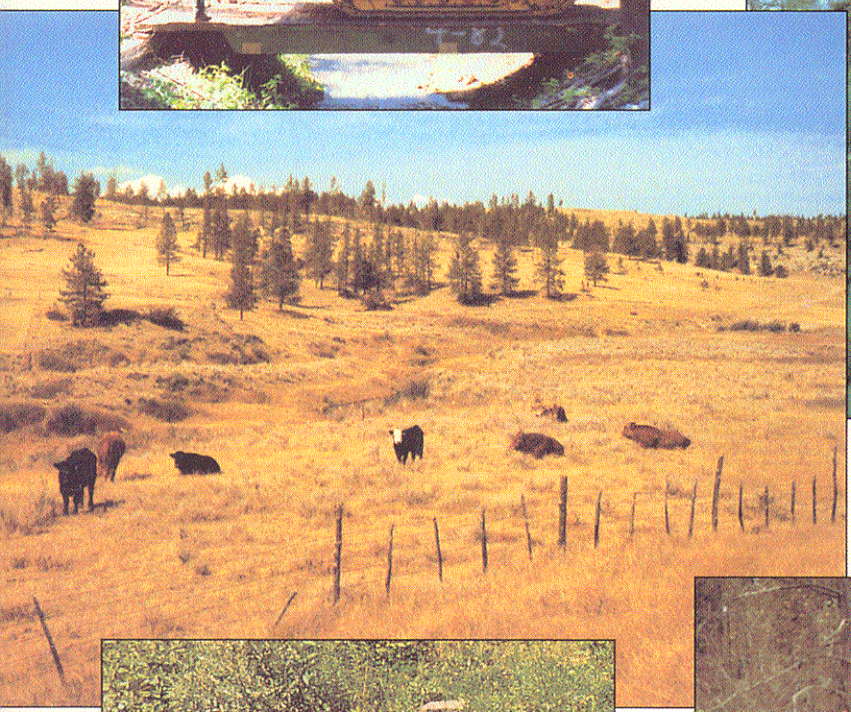
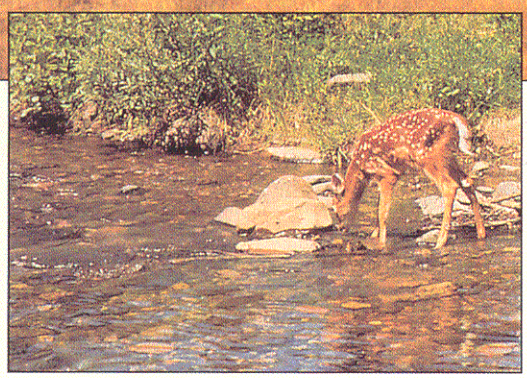
Forestry for Idaho BMP's

Best Management Practices









University of Idaho
Cooperative Extension System

Forest Stewardship Guidelines for Water Quality

Developed in cooperation with:

IDAHO DEPARTMENT OF LANDS
Bureau of Forestry Assistance

UNIVERSITY OF IDAHO
Cooperative Extension System

IDAHO FOREST PRODUCTS COMMISSION

MONTANA DEPARTMENT OF NATURAL RESOURCES AND CONSERVATION

USDA FOREST SERVICE
State and Private Forestry

Concept originally developed by:

BOB LOGAN
Forestry and Natural Resource Specialist
Montana State University Extension Service

BUD CLINCH
Industry BMP Education Coordinator
Montana Logging Association

Adapted to Idaho by:

DEWEY ALMAS
JIM COLLA
Idaho Department of Lands

CHRIS SCHNEPF
University of Idaho
Cooperative Extension System

Photograph Credits

Bud Clinch and Montana Logging Association

Karen Wattenmaker

Mark Ingraham

MT Dept. of Fish Wildlife and Parks

MT Dept. of State Lands

MT State University Extension Forestry

Rocky Mtn. Rgr. Stn. - USFS

Stoltze Land & Lumber Co.

UI Cooperative Extension System

Cooperative funding provided by:

Idaho Department of Lands

Idaho Forest Products Commission

For information about ordering this publication, contact on of the following:

Idaho Department of Lands
Bureau of Forestry Assistance
3780 Industrial Avenue South
Coeur d'Alene, Idaho 83815
(208) 769-1525

Idaho Forest Products Commission
315 N. 9th Street, Suite 304
Boise, Idaho 83702
(208) 334-3292
www.idahoforests.org

For information about BMP's and their application, contact your local Idaho Department of Lands field office.

December 2000

Idaho's forest lands supply beauty, pure water, abundant wildlife, minerals, recreation, forage, timber, and thousands of jobs. This book is dedicated to the **stewardship** of those qualities — especially pure water. It describes Best Management Practices (BMP's) for protecting water quality.

If you work in the forest, own forest land, or are concerned about our forests, this publication is for you. It contains BMP guidelines and gives reasons for BMP's, not just rules. However, reading these pages is not enough. Maintaining our forests' productivity and benefits can only be achieved by on-the-ground application of BMP's.

How you apply BMP's in the forest will require practice and personal judgement. Following the principles in this publication will help you comply with the **Idaho Forest Practices Act** (FPA - see below). For more specific details on FPA rules, contact the nearest Idaho Department of Lands (IDL) office. Most forest operators in Idaho are familiar with the act and conduct forest practices that exceed the minimum requirements of Idaho Law.

The Idaho Forest Practices Act (FPA)

The Forest Practices Act was passed by the 1974 Idaho Legislature to assure the continuous growing and harvesting of forest trees and to maintain forest soil, air, water, vegetation, wildlife, and aquatic habitat. The Act requires forest practices rules for state and private lands to protect, maintain, and enhance our natural resources. Federal land practices must meet or exceed the requirements of the state rules. The Act provides for an advisory board of forest landowners, operators, informed citizens, and environmental and fisheries experts to recommend rules to the State Land Board.

When a careless or destructive operation is found in violation of the rules and corrective measures are not taken in a reasonable time, the Idaho Department of Lands will take enforcement action against the responsible operator. Forest Practice Advisors, located statewide, also provide technical assistance to forest owners and operators who wish to learn about proper forest practices.

Notification of Forest Practice

Since 1975, operators have notified IL of forest practices by securing a Slash Compliance or "brush number" and Forest Practice Notice. Five categories of forest practice require notification: (1) timber harvesting and related road construction; (2) road construction and reconstruction away from the harvesting area but associated with harvesting; (3) reforestation; (4) application of chemicals for forest management purposes; (5) the management of slash resulting from harvest, management, or improvement of forest tree species, and the use of prescribed fire.

Notification is made at a local IDL office by filling out a Certificate of Slash Compliance/ Notification of Forest Practice. No plan or permit is required. The forest practice may begin upon IDL acceptance of the notification. Copies of the notification are sent to the landowner, timber owner, and operator.

The notification is valid for the same period as the slash compliance. Upon expiration, it must be renewed before the practice can continue. Extensions and other changes in the notification must be made within 30 days by the person who filed the original notification. Notification of emergency forest practices due to fire, flood, windthrow, or earthquake may be made up to 48 hours after such practices are started.

Exemptions

No notification is required for the following forest practices: routine road maintenance, recreational uses, grazing by domestic livestock, cone picking, culture or harvest of Christmas trees, or harvesting other minor forest products; and noncommercial cutting and removal of trees for personal use; and prepatory work such as tree marking, surveying and road flagging.

Penalties

IDL will not accept new notifications until violations are resolved. Repeated violations may result in the operator posting a bond. Violation of the rules is also a misdemeanor. IDL can take civil action to recover repair and legal costs if a violation that causes resource damage is not repaired by an operator.

Contents

INTRODUCTION
Watersheds 2

ROADS
Idaho Forest Owners 4
Standards and Use 5
Planning, Design, and Location 6
Road Construction 8
Drainage from Road Surface 10
Maintenance 12
Road Closures 13

STREAMSIDE MANAGEMENT
What is an SPZ? 14
Benefits of SPZ's 16
SPZ Boundaries 18
Harvesting in and Around SPZ's 19
Conifer Regeneration 20
Idaho Stream Protection Rules 20

TIMBER HARVESTING
Harvest Design 21
Skyline Logging Unit 22
Skidder Logging Unit 23

OTHER HARVESTING ACTIVITIES
Cross-ditches 24
Slash Treatment and Site Preparation 25
Reforestation Requirements 26

WINTER ACTIVITIES
Winter Harvesting Considerations 27
Winter Road and Drainage Considerations . . . 28

HAZARDOUS SUBSTANCES
Pesticides and Herbicides 29

STREAM CROSSINGS
Legal Requirements 30
Design Considerations 31
Installation of Stream Crossings 32

Watersheds

In northern Idaho alone, at least 42 public water systems depend on surface water, collected from forested watersheds, for their main source of domestic water. Throughout Idaho, forest lands act as collectors of pure water. Protecting the source of pure water is the responsibility of both forest landowners and loggers. Best Management Practices (BMP's) are guidelines that should be used to direct forest activities and protect water quality.

Areas of land called watersheds (center photo) collect precipitation and funnel it through a network of stream channels to an outlet at the bottom. Logging, road construction, and other forest activities can disturb soil, cause erosion, and release sediment into a watershed outlet.

A "cumulative effect" is the incremental impact of two or more forest practices. The FPA provides a process to identify voluntary practices that mitigate cumulative effects.

Perennial and intermittent streams and ephemeral areas (e·fem·r·wl) are often found in forested watersheds (note these in photo). Ephemeral areas drain water to intermittent stream channels. These carry the water to perennial streams, which flow to the watershed outlet. Any sediment created by soil erosion during logging or road building activities can be carried by way of ephemeral, intermittent, and perennial stream channels to the watershed outlet.

Ephemeral areas generally occur above the upper reaches of intermittent streams. Since they can direct water into intermittent stream channels, care should be taken to minimize disturbing soil in these areas.

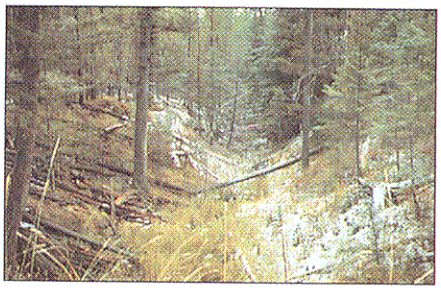
Roads, skid trails, and landings can act as man-made streams carrying sediment when improperly planned, located, or constructed. If BMP's are not followed, sediment can make its way to the watershed outlet, creating problems downstream.

Wetlands found within a watershed include seeps, springs, wallows, marshes, and bogs. Some drain into streams, others do not. When forest activities occur in or around these areas, they should receive protection. Even when dry, they can be identified by the presence of certain plants.

Class I Streams / Class II Streams

The Idaho Forest Practices Act distinguishes further, between Class I Streams, which are used for domestic water supply or by fish, and Class II Streams, which are not used by fish but influence Class I Streams.

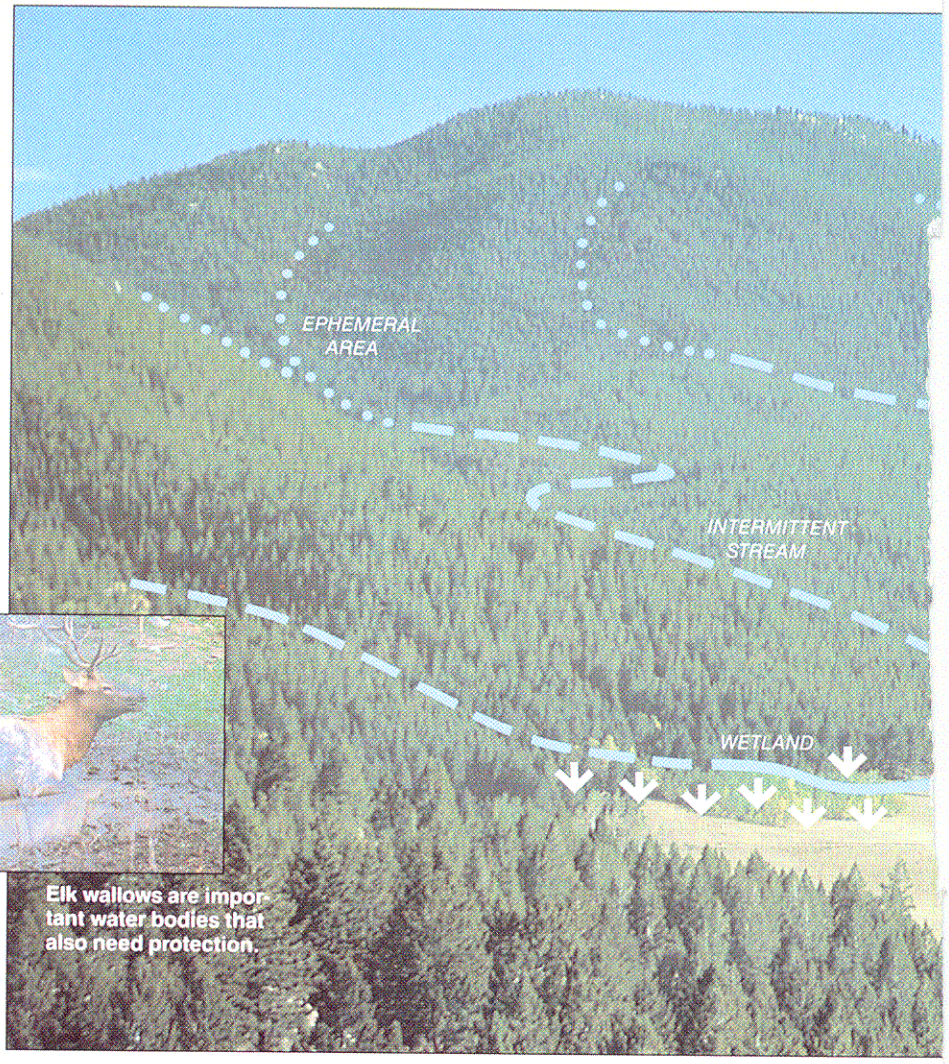
EPHEMERAL AREA



Torn-up soils in ephemeral areas can be carried downhill during heavy rainfall or snowmelt.

INTERMITTENT STREAM

Whether wet or dry, intermittent streams have gravel bottoms and identifiable banks. They connect ephemeral areas with perennial streams.



Elk wallows are important water bodies that also need protection.

Across all of Idaho, damage to intermittent beds and streambanks results in sediment being carried to perennial streams during high flow periods.

INTERMITTENT STREAM

Many perennial streams are important water sources. They must be kept free of sediment.

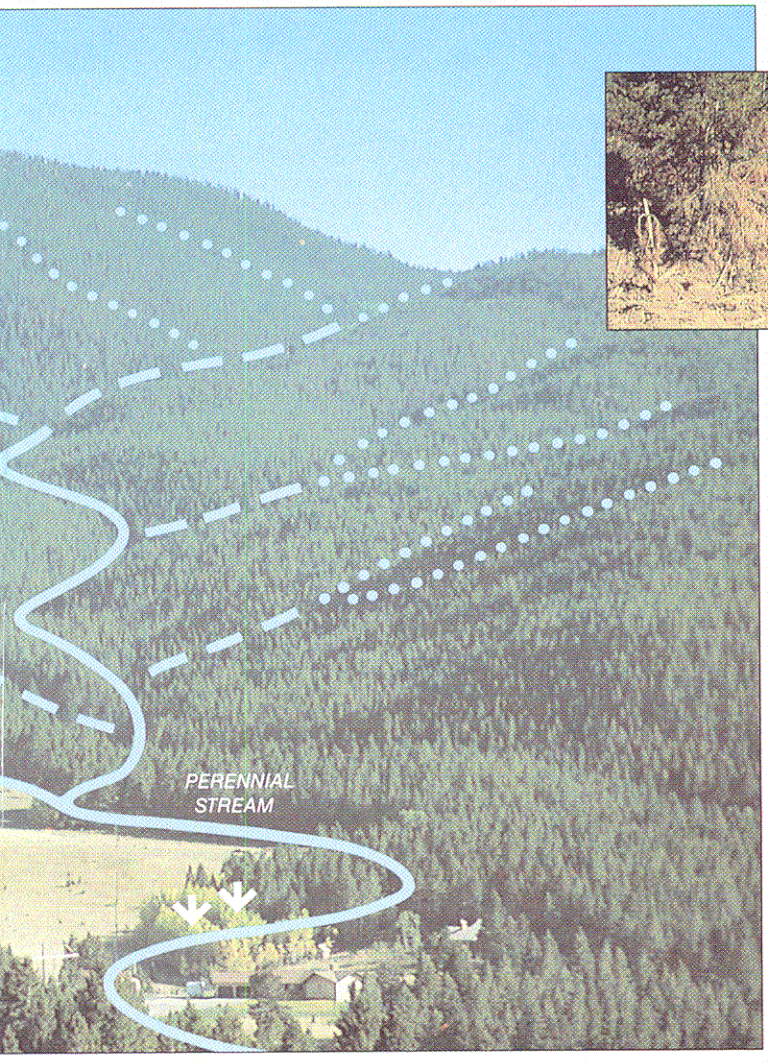
PERENNIAL STREAM

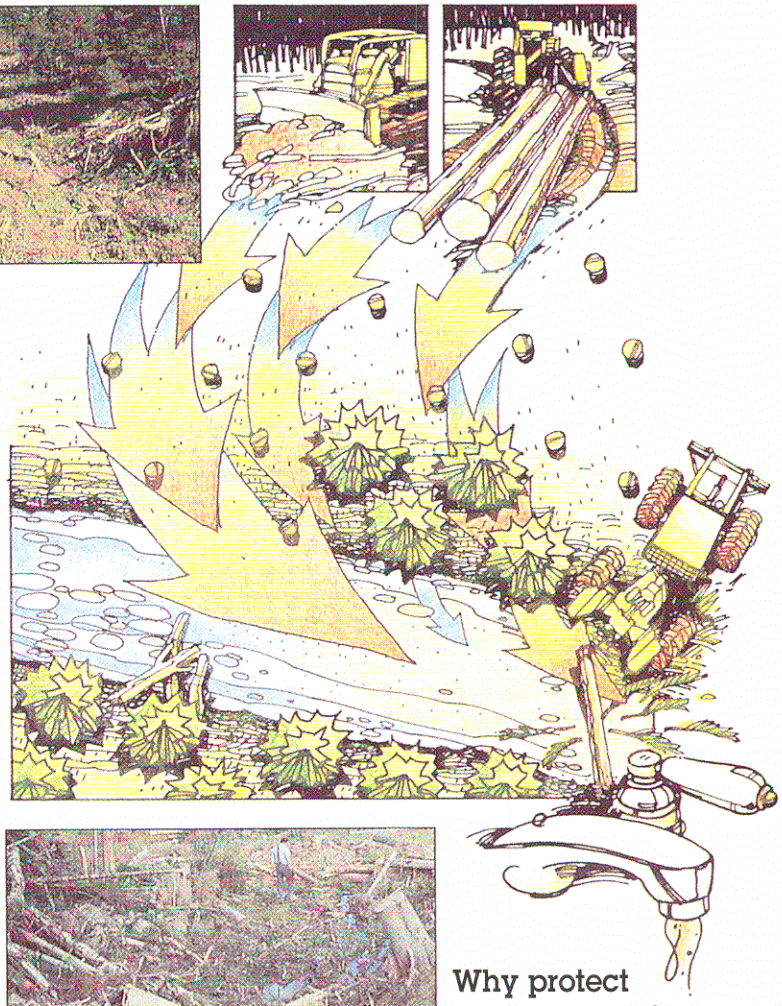
PERENNIAL STREAM

Sediment from ephemeral areas can end up in perennial streams causing downstream impacts.

Tree harvesting and other forest management activities can have minimal impacts to forested watersheds if conducted with careful regard to water quality. However, poor logging practices can cause excessive erosion. Tearing up the Topsoil on the forest floor destroys its filtering action, and compacting the soil affects surface water absorption. When surface water is allowed to flow into roads and trails, they become man-made streams that increase in speed and volume as they flow downstream. They tear away the soil, destroy roads, overload streams with sediment, and damage streambanks.

Ephemeral areas used as skid roads can contribute to stream sediment. Avoid this practice.





Springs, swamps, seeps, marshes, and bogs all contribute to the watershed collection system and require BMP protection.

WETLANDS

Ignoring BMP's can result in damaged streams, unhappy downstream neighbors, and penalties ($).

Why protect water quality?

Excessive runoff and sedimentation into streams can increase filtering costs for drinking water, interfere with irrigation systems, and increase flood potential. Fish eggs laid in stream gravels become buried in sediment and suffocate. Removing shade from streamsides can raise water temperatures, which affects fish and other aquatic life. Streamside damage also affects wildlife that rely on these habitats.

ROADS

Wetlands are important habitat. Design roads around wetlands and avoid equipment operation in these areas.

Roads are necessary to access forest lands for a multitude of uses. While roads are generally the largest producer of sediment on forest land, BMP's are designed to reduce or eliminate sediment delivery from roads.

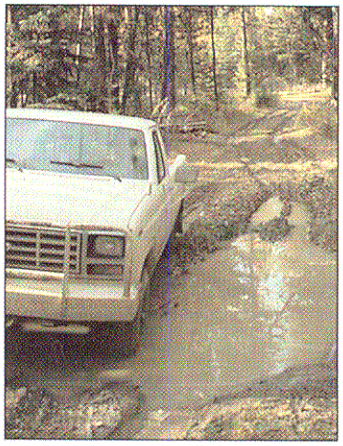
To find out how BMP's are being applied, NIPF lands, along with industry and public lands, have been audited every four years since 1982. Small teams of experts visited randomly selected timber harvests to determine whether BMP's were being applied and how effective they were at protecting water quality. IDL Forest Practice advisors also conduct forest practice inspections. As a result of audits and inspections, the FPA is constantly revised to address actual on-the-ground problems

Idaho Forest Owners

In addition to public and industry owned forest land, there are 30,000 individuals who own 2 million acres of commercial forest land in Idaho. They are called Non-industrial Private Forest (NIPF) landowners and they are important. Their ownership is twice the acreage owned by industrial timber companies. The application of BMP's on NIPF lands is just as important as on other forest ownerships.

NIPF Landowners play a major role in protecting water quality. Plan your forest activities to include BMP's.

Logging activities using unimproved roads must be limited to dry seasons. Landowners and their logging operators should shut down before conditions get this bad and water quality is affected.



Unimproved stream crossings that result in stream sediment, damage to stream banks, or damage to stream beds are unacceptable.

Plans for permanent stream crossings must include calculations for 50-year floods. When future floods are ignored, the potential for water quality damage is enormous. Commonly, costs of repair far exceed costs of proper installation.

Timely road grading and restricting road use during wet periods can help ensure adequate surface drainage on unimproved roads.

Standards and Use

The need for higher standard roads can be alleviated through better road-use management

More and more, forest roads provide access to our favorite recreation areas.

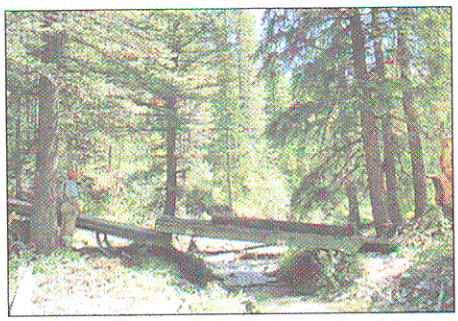
Problems occur when forest roads, built to provide access for timber harvesting, must also provide for traffic to recreation sites or homes. Such road costs may exceed $100,00 per mile.

The alternative to accommodate all these uses is better road use management.

Access control through locked gates is one method of road use management. Seasonal weather conditions may also restrict access.

When access for forest activities requires crossing moist areas with a poor road base, cross only when the ground is frozen. Return during the dry season to do site preparation and slash treatment.

Low-standard roads involve only the clearing of vegetation and minimal construction.



A railroad flatcar can be a portable bridge providing access across streams with minimal disturbance to stream banks or bed. (Stream Channel Alteration Permit may be required.)

Along with the portability, this temporary bridge is strong enough for all harvesting activities.

Road restoration includes pulling up roadside berms, ripping compacted areas, restoring natural drainage, and reseeding with appropriate grasses.

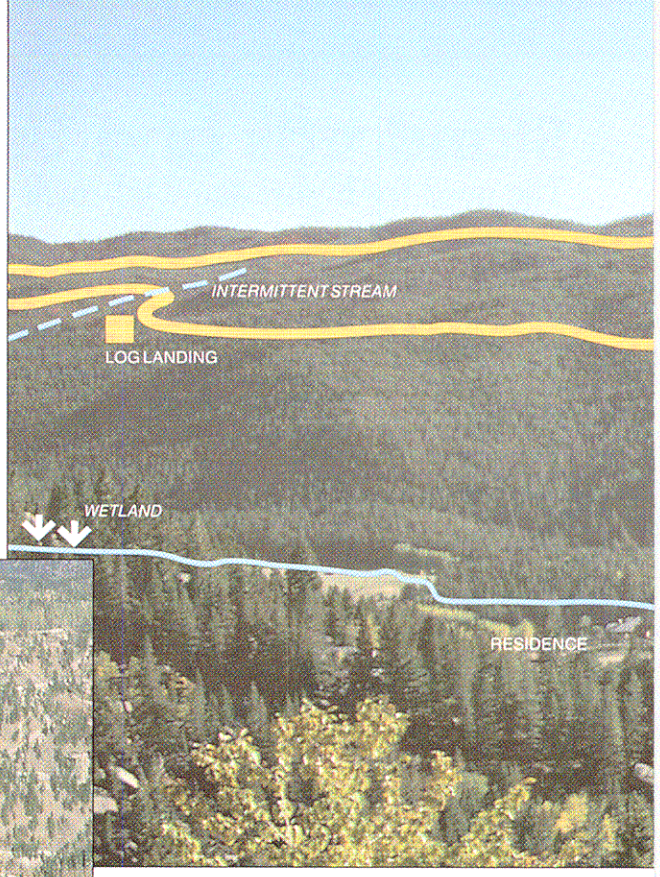
■ To minimize disturbances and damage, plan each road to the minimum use standards adapted to the terrain and soil.

Temporary low-standard roads are designed for short-term minimal use during timber harvesting. They can be constructed, used, and reclaimed during seasons when precipitation and erosion potential is minimal.

When stream crossings are needed, portable bridges can be used. These temporary bridges are quick, economical, and can be installed with less impact than other alternatives.

Planning, Design, and Location

- Plan road standards and specifications that maintain forest productivity, water quality, and fish and wildlife habitat.
- Road specifications and plans should be consistent with good safety practices. Plan each road to the minimum standards for the intended use. Adapt the plans to the soil materials and terrain, to minimize disturbance and damages to forest productivity, water quality, and wildlife habitat.
- Avoid road construction within stream protection zones except for approaches to stream crossings. Leave or re-establish areas of vegetation between roads and streams.
- Plan roads no wider than necessary for safety and anticipated use. Minimize and balance cuts and fills, especially near streams. Fit the road to the natural terrain as closely as possible.
- Compact fill material or plan to dispose of excavated waste material on geologically stable sites.
- Plan natural road cross-drainage by insloping or outsloping and by grade changes. Plan for effective, well-placed dips or waterbars.
- Design relief culverts or roadside ditches where natural drainage will not protect the road surface, excavation, or embankment. Plan culvert locations to prevent fill erosion or direct discharge of sediment into streams.
- Plan minimum number of stream crossings. Make sure they comply with Stream Channel Alteration Law, Title 42; Chapter 38, Idaho Code. Be sure all Class I stream culvert installations allow fish passage.
- Consider reusing existing roads if new construction would result in more long-term impact to fish and wildlife.



Roads produce up to 90 percent of all sediment from forest activities. That's why planning, design, and location of forest roads is so critical. Critics of forest roads point to excessive road building, evident on many hillsides.

More cooperation and planning among adjacent forest landowners within a watershed is necessary to reduce sedimentation from roads and to minimize the obvious visual impact.

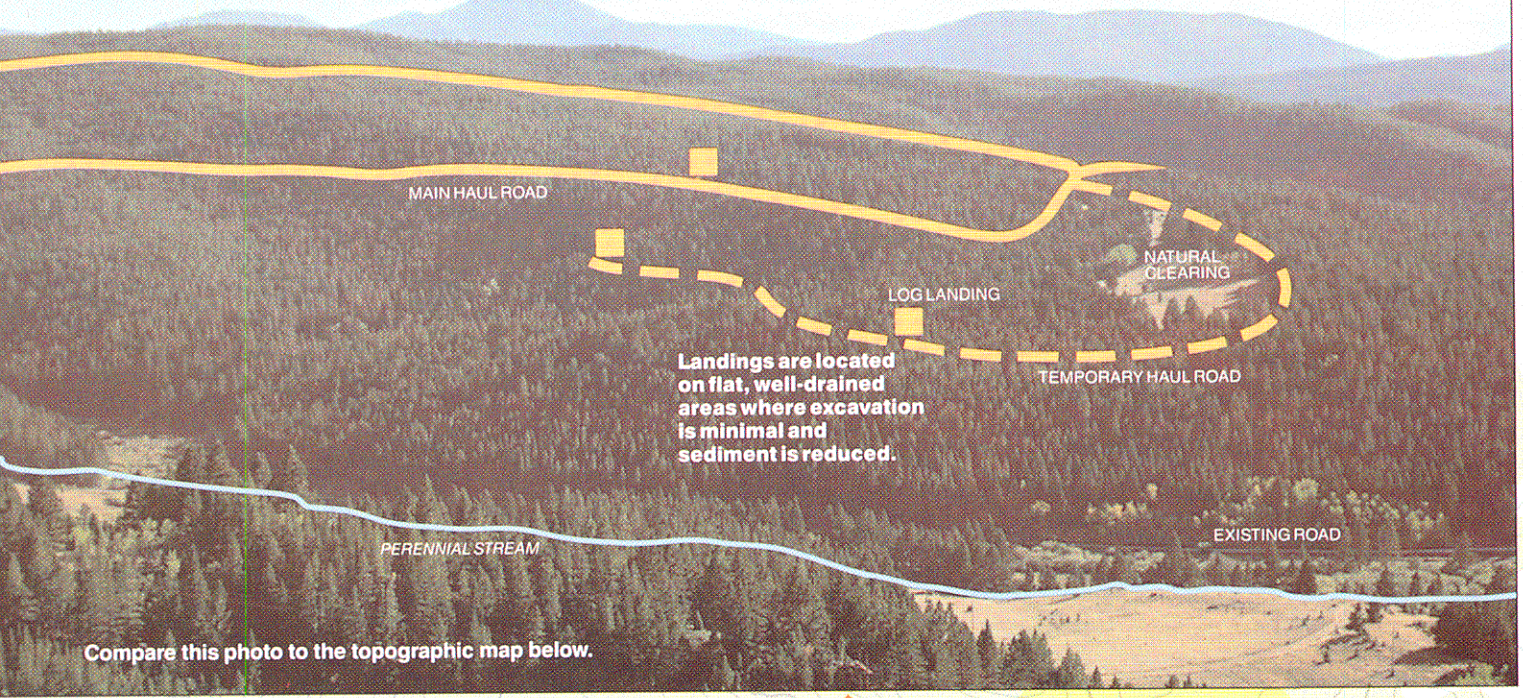
Rock layers that slant with, rather than into the slope, are a clue to potentially unstable bedrock conditions. When planning roads in these locations, get expert advice.

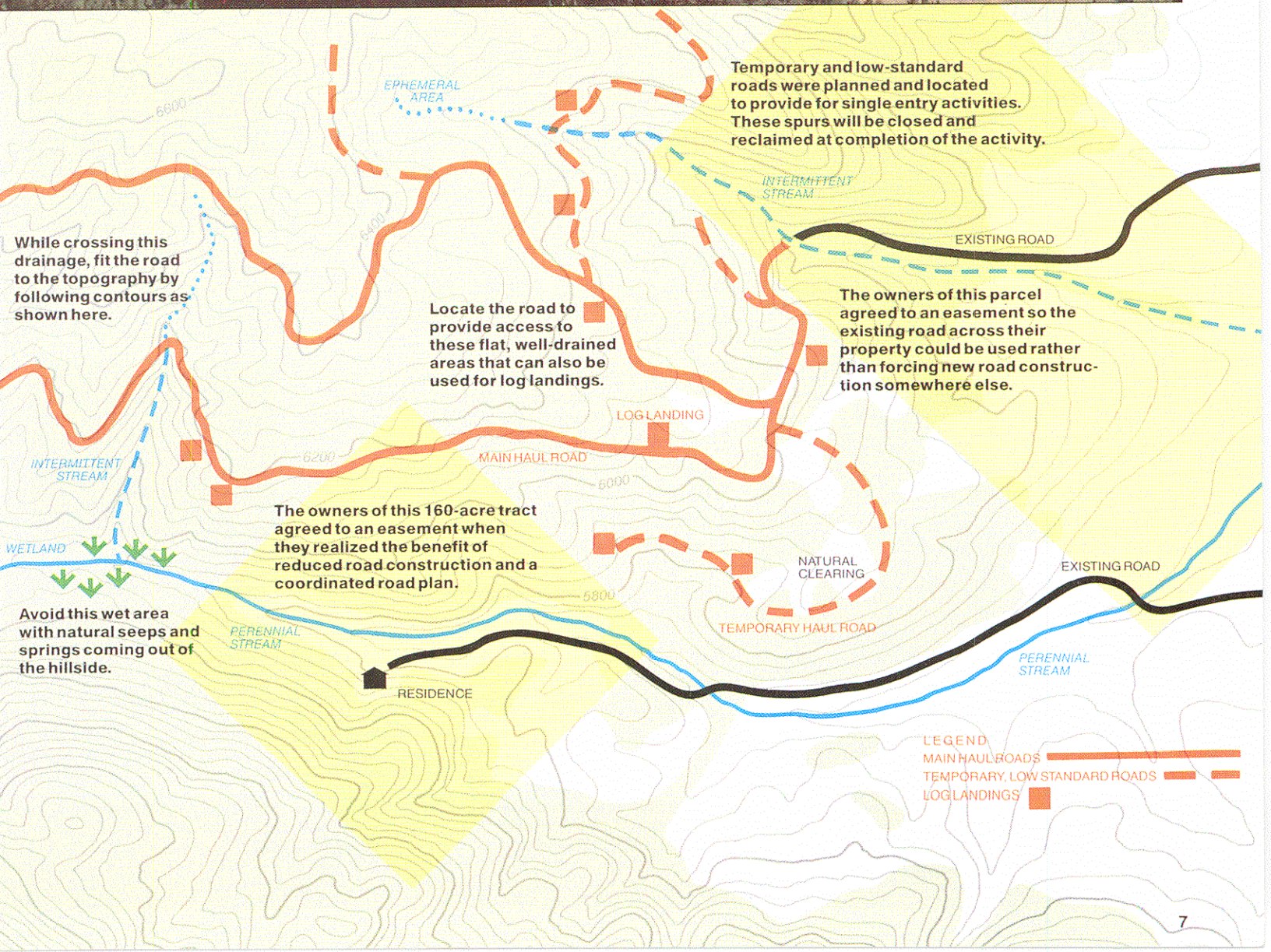
Roads dictate the location of log landings. When roads use natural benches and flat areas, excavation for landings is reduced. Sediment from landing construction is also reduced.

Roads located in steep canyons have been common practice for decades. Unfortunately, they require substantial cuts and fills, often increasing erosion potential into the drainage below. Avoid these locations.

A road system has been designated on the topographic map below for the forested area shown in this photo. The area consists of mixed ownership, and has some existing roads.

To comply with BMP's and minimize the number of roads, landowners were contacted during road planning. Mutual agreement among all affected landowners resulted in the road location indicated on the topographic map and plotted on the photo of the area. On-the-ground problems that influenced road location are pointed out.





Road Construction

See also Stream Crossings, pages 30-33.

Once clearing limits and road design features are staked out, road construction begins. Timber is cut and logs and vegetation are removed and piled along the lower side of the right-of-way.

Excavations efficiently dig, swing, and deposit material with accuracy and care. Slumps and other vegetative debris are swept clean from the new road surface and promptly disposed of in burn pits.

While pioneering, temporary crossings are used to get beyond a stream and continue clearing. Several logs, placed in the stream channel, form a base that water can flow through while protecting stream banks. This is replaced promptly with a permanent crossing (culvert or bridge, page 30).

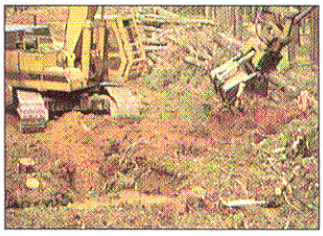
Forest roads are often built by excavating the road surface out of a hillside. A bulldozer or excavator starts at the top of the cut slope, excavating and sidecasting, or removing material until the desired road width is obtained.

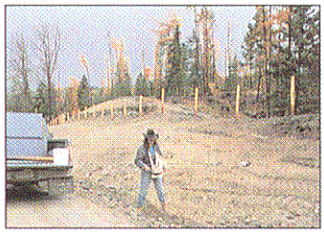
An experienced bulldozer operator can do many road construction tasks, including drainage features. The inside ditch and catch basin, formed just below the culvert inlet, prevents ditch water from bypassing the culvert.

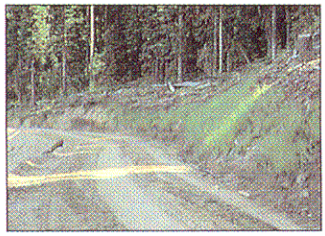
Following up the bulldozer is a grader, providing the final smoothing of the road surface and shaping of inside ditches and drainage features.

Grass seeding raw, exposed cut and fill surfaces is an important erosion control practice. Exact seed mixtures, proper timing, and fertilizers and mulch are important for success (consult with experts).

Seeding stabilizes soil, prevents erosion, and indicates landowner's concern for potential erosion.





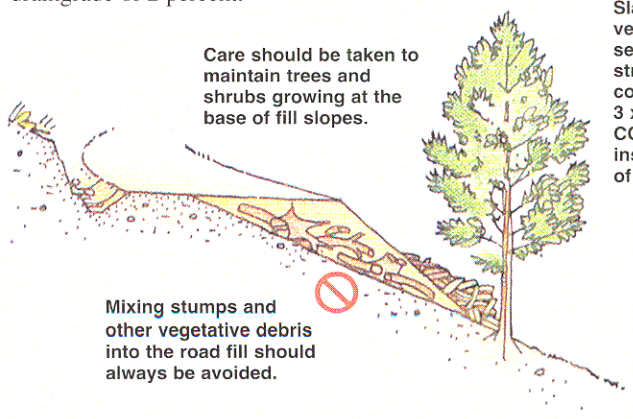


Control erosion during the construction process:

- Construct or reconstruct roads in a manner that prevents debris, overburden, and excess materials from entering streams. Deposit excess materials outside of stream protection zones.
- Postpone earthwork or material hauling when roads are saturated and likely to erode.
- Provide for quarry drainage, to prevent sediment from entering streams.
- Clear drainage ways of all debris, generated during construction or maintenance, that may interfere with drainage or impact water quality.
- When constructing road fills compact the material to settle it, reduce erosion, and reduce water entry into fill. Minimize snow, ice, frozen soil, and woody debris buried in embankments. Limited slash and debris may be windrowed along the toe of the fill to provide a filter near stream crossings.
- Construct road stream crossings or roads constricting upon a stream channel in compliance with the Stream Channel Alteration Law, Title 42, Chapter 38, Idaho Code.

Stabilize slopes:

- Where exposed material (Excavation, embankment, waste piles, etc.) is erodible and may enter streams, stabilize it before fall or spring runoff by seeding, compacting, riprapping, benching, mulching, or other suitable means.
- Retain outslope drainage during or following operations and remove outside edge berms except those protecting road fills.
- Construct cross drains and relief culverts to prevent erosion. Minimize construction and installation time. Use rip rap, vegetation matter, down spouts, or similar devices to prevent erosion of fills. Install drainage structures on uncompleted roads before fall or spring runoff.
- Install relief culverts with a minimum draingrade of 2 percent.



Cutting back an inside slope and removing vegetation crowding the roadway are road reconstruction activities that improve vehicle safety and visibility.

Over time, it's often necessary to add culverts for improved drainage. Anticipating the need for additional culverts can avoid drainage problems.

Deep, wide road fills like this can be stabilized with log terraces. After installation, the entire fill is seeded with appropriate grass cover.

Slash filter windrows are very effective at keeping sediment from entering stream channels. They commonly measure at least 3 x 3 feet and consist of COMPACTED slash installed along the base of the fill slope.

■ Design roads to balance cuts and fills or use full bench construction where stable fill construction is not possible.

Most forest roads are built by excavating a road surface. Road design and layout on-the-ground show machine operators the proper cut slopes and indicate cut slope steepness. The bulldozer starts at the top of the cut slope, excavating and sidecasting material until the desired road grade and width is obtained. Material from cuts is often pushed or "drifted" in front of the blade to areas where fill is needed. Road fill is used to cover culverts and build up flat areas. Since fill must support traffic, it needs to be spread and compacted in layers to develop strength.

While cut-and-fill road construction is common for gentle terrain, full-bench roads are usually built on slopes over 65 percent. In full-bench construction, the entire road surface is excavated into the hill. The excavated material is pushed or hauled to an area needing fill or to a disposal area.

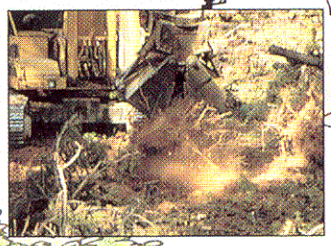
During the process of cut-and-fill, it is critical to avoid letting sidecast or waste material enter streams or placing it on unstable areas where it might erode.

■ Roads constructed on unstable slopes greater than 60% must be full benched without fillslope disposal.

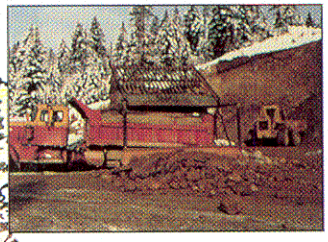
Considerations for borrow pits and overburden disposal:

■ Minimize sediment production from borrow pits and gravel sources through proper location, development, and reclamation.

■ Place debris, overburden, and other waste materials associated with construction and maintenance activities in a location to avoid entry into streams. Include these waste areas in soil stabilization planning for the road.



Excavators remove stumps clean and free of soil, minimizing the chance of sediment moving off the construction site.



Be aware of the potential for borrow pits to contaminate surface water. Take precautions to control drainage and escaping sediment.

Surfacing can double the cost of a forest road. However, gravel roads provide water quality protection because soil is covered with a more weather resistant surface. Erosion is reduced, and the operating season may be extended.

Machine maintenance in the forest can result in water contamination. Dispose of used oils, filters, and parts responsibly (pack it out).

Burn bays are used to dispose of root wads, slash, and vegetative debris during road construction. To prevent contamination of water, locate burn bays away from water sources.

Drainage from Road Surface

■ Vary road grades to reduce concentrated flow in road drainage, ditches, culverts, and on fill slopes and road surfaces.

Well-designed forest roads with changing road grades, adequate ditches, and crossdrain culverts are important for controlling drainage and ensuring water quality.

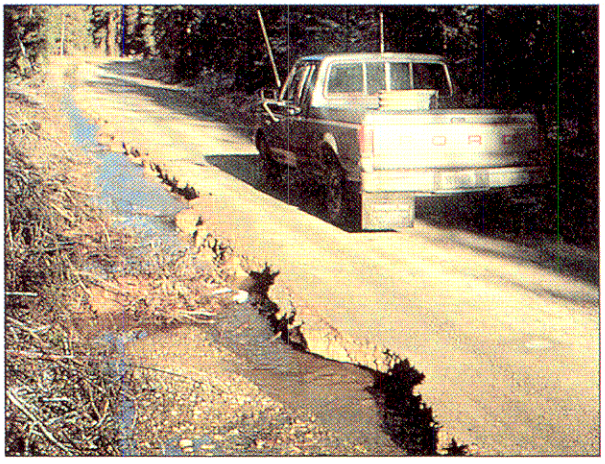
In contrast, the road drainage problem is the result of a plugged crossdrain culvert and washed-out catch basin.

■ Provide adequate drainage from the surface of all permanent and temporary roads by using outsloped or crowned roads, drain dips, or insloped roads with ditches and crossdrains.

■ Space road drainage features so peak drainage flow on the road surface or in ditches will not exceed the capacity of the individual drainage facilities.

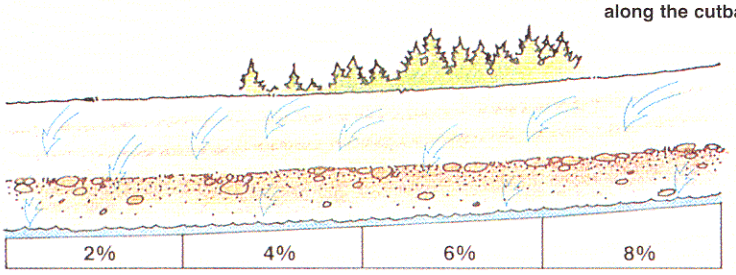
■ Outsloped Roads: Outsloped roads provide means of dispersing water in a low-energy flow from the road surface. Outsloped roads are appropriate when fill slopes are stable, drainage will not flow directly into stream channels, and transportation safety considerations can be met.

■ Insloped Roads: For insloped roads, plan ditch gradients steep enough, generally greater than 2 percent, but less than 8 percent, to prevent sediment deposition and ditch erosion. The higher gradients may be suitable for more stable soils; use the lower gradients for less stable soils.



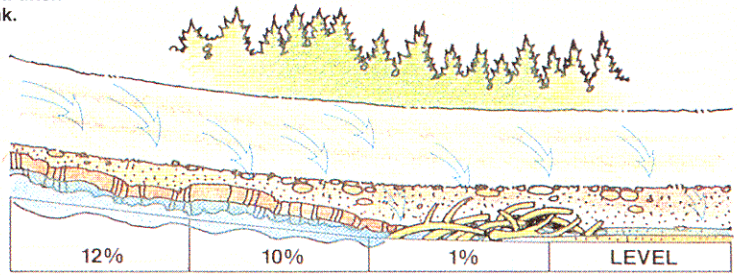
A smooth surface is the key to an effective outsloped road. Smoothing and out-sloping (from cutbank to outside edge of roadbed) should be kept current, so water can drain across without creating channels on the road surface.

Insloped roads carry road surface water to a ditch along the cutbank.



Ditch gradients of 2 to 6 percent are just steep enough to keep collected waters moving to relief culverts without carrying excessive sediments.

An 8 percent ditch gradient may be too steep for unstable soils.

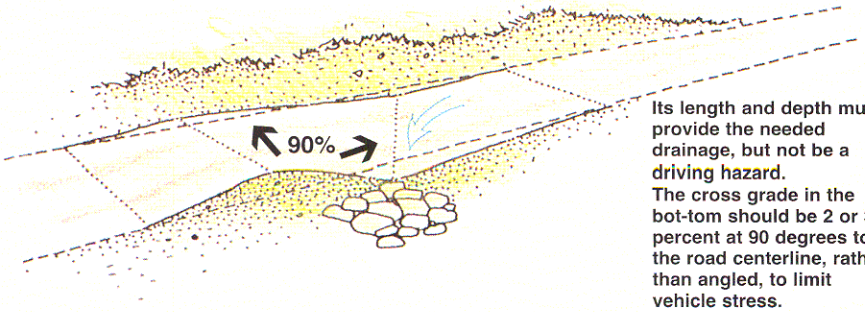


Gradients steeper than 8 percent give collected waters too much momentum and the ability to carry excessive sediment and debris for great distances.

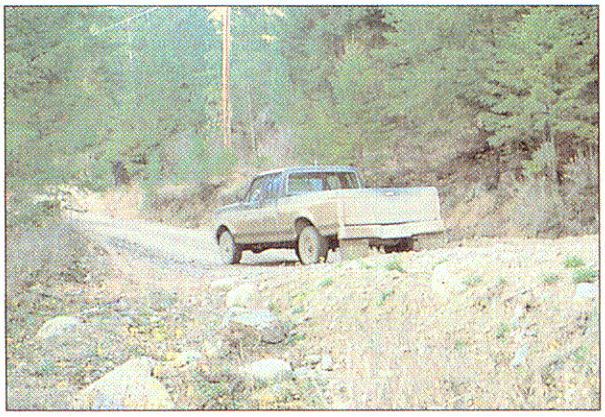
This erosion leads to filling up the ditch where the gradient is too shallow, clogging culvert inlets and carrying sediments into streams.

■ Drain Dips: Properly constructed drain dips can be an economical method of channeling surface flow off the road. Construct drain dips deep enough into the subgrade so that traffic will not obliterate them.

A drain dip is a portion of road sloped to carry water from the inside edge to the outside onto natural ground.

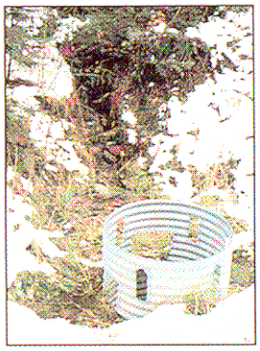


Its length and depth must provide the needed drainage, but not be a driving hazard. The cross grade in the bot-tom should be 2 or 3 percent at 90 degrees to the road centerline, rather than angled, to limit vehicle stress.

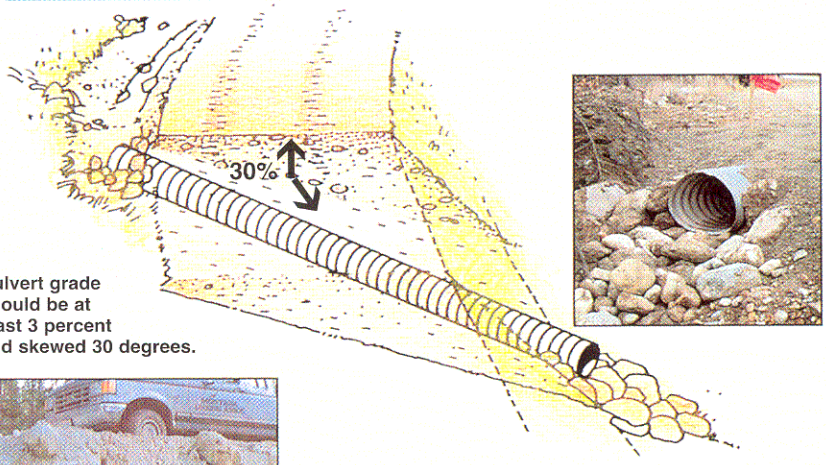


Design roads for minimal disruption of drainage patterns.

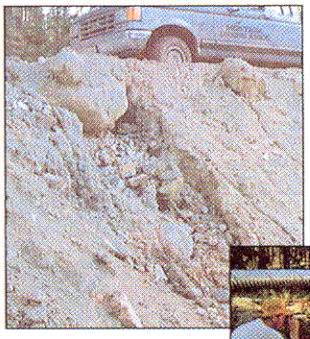
- Prevent downslope movement of sediment by using sediment catch basins, drop inlets, changes in road grade, headwalls, or recessed cut slopes.
- Where possible, install ditch relief culverts at the gradient of the original ground slope; otherwise armor outlets with rock or anchor downspouts to carry water safely across the fill slope.
- Skew ditch relief culverts 20 to 30 degrees toward the inflow from the ditch to improve inlet efficiency. Protect the upstream end of cross-drain culverts from plugging.
- Provide energy dissipators (rock piles, logs, etc.) where necessary at the downstream end of ditch relief culverts to reduce the erosion energy of the emerging water.
- Crossdrains, culverts, water bars, dips, and other drainage structures should not be discharged onto erodible soils or fill slopes without outfall protection.
- Route road drainage through SPZ, vegetative filtration fields, slash windrows, or other sediment settling structures. Install road drainage features above stream crossings to route discharge into filtration zones before entering a stream.



Drop inlets (left photo) installed at the head of a ditch relief culvert slow the flow of water, help settle-out sediment, and protect the culvert from plugging. Rock armored inlets (right photo) prevent water from eroding and undercutting the culvert and flowing under the road.

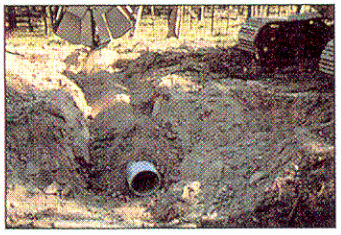


Culvert grade should be at least 3 percent and skewed 30 degrees.



Poor road surface drainage caused this fill slope erosion.

To avoid soil erosion reduce the outlet speed of culvert water by running outlet water over a bed of energy dissipators of rock or logs.



Ditch relief culverts transfer water from a ditch on the uphill side of a road, under the grade and release it onto a stable area. They prevent water from crossing the road surface and softening the road bed. Install culverts at least 12" in diameter at a 30 degree downgrade angle to enhance flow. Ensure proper slope of at least 5 inches every 20 feet. Seat the culvert on the natural slope. Bedding material should be free of rock or debris that might puncture the pipe or carry water around the culvert. Cover with soil, avoiding puncture from large rocks. Compact soil at least halfway up the side to prevent water from seeping around the culvert. Rule of thumb for covering culverts: minimum of 1 foot or one-third the culvert diameter, whichever is greater. Be sure outlet end extends beyond any fill and empties onto an apron of rock, gravel, brush, or logs.

One of the most common road drainage problems is allowing ditch drainage to flow directly into a stream. Always route ditch drainage through a filter (SPZ, slash filter windrow, etc.) so sediment can be removed before water reaches the stream.

The ditch in the right photo is a direct route to the stream. Never let this happen.

Maintenance

- Maintain erosion control features through periodic inspection and maintenance, including cleaning dips and crossdrains, repairing ditches, marking culvert inlets to aid in location, and clearing debris from culverts.
- Avoid using roads during wet periods if such use would likely damage the road drainage features.

Road grading precautions:

- Grade road surfaces only as often as necessary to maintain a stable running surface and to retain the original surface drainage.
- Avoid cutting the toe of cut slopes when grading roads or pulling ditches.
- Place all excess material removed by maintenance operations in safe disposal sites and stabilize these sites to prevent erosion. Avoid locations where erosion will carry materials into a stream.

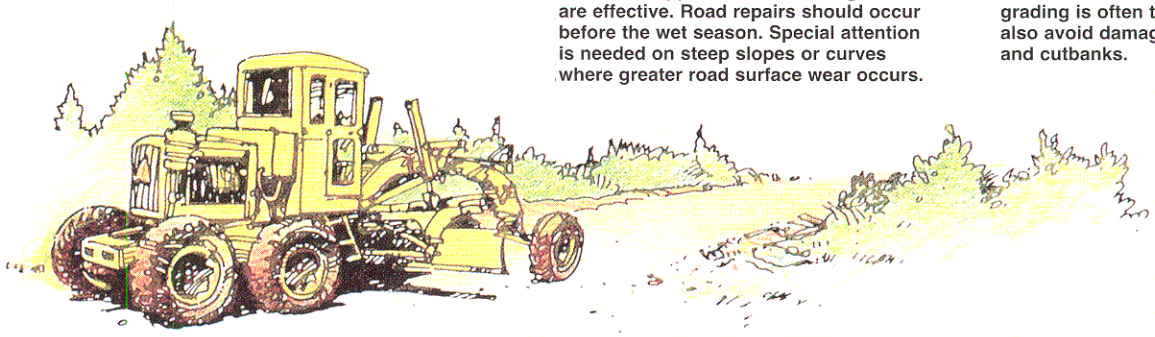
Hand, shovel, and chainsaw work are usually all that culvert maintenance requires. But don't delay! Delay in cleaning a blocked culvert or ditch can result in a damaged road that requires costly reconstruction.

Because roads receive heavy use during logging, be aware of early signs of damage. Serious damage to road surfaces starts with excess water. Standing water is a sure sign of road drainage problems. Ruts indicate that road strength is deteriorating.

Road surfaces usually have a crown or slope (inslope or outslope). Vehicle traffic and freezing and thawing can damage road surfaces and reduce drainage effectiveness. Grading repairs the drainage, by smoothing surface ruts and potholes. However, avoid grading sections of road that don't need it. It creates a source of sediment from the newly disturbed surface. Raise the blade where grading is not needed!

Before grading, it may be necessary to loosen hardened or deep rutted road surfaces. Ripper shanks on the grader are effective. Road repairs should occur before the wet season. Special attention is needed on steep slopes or curves where greater road surface wear occurs.

Grader damage to inside ditch toe slopes exposes an easily erodible surface and is a source of sediment. Slow, controlled grading is often the solution, and it can also avoid damage to ditches, culverts, and cutbanks.



Road surfaces can be protected with the use of water or chemicals. Significant amounts of road surface can be lost as dust, and dust abatement materials serve to decrease rutting. However, they can be pollutants and caution should be used in their application near streams or drainages.

If grading produces excess material, feather it out or haul it away. Never side-cast material into streams. Avoid leaving a berm that channels water down the road unless it is routed into an effective vegetation filter that spreads it out and removes sediment.

Preventive maintenance can reduce the need for culvert cleaning. In recently logged areas, floatable debris should be cleaned from drainage ditches that direct water to culverts.

Traffic control on forest roads can be an effective way to reduce road maintenance costs, and provide protection of other forest resources. Traffic control can include: full road closure, temporary or seasonal closure, or road open but restricted to only light use. Any degree of control still requires inspection for maintenance needs.

Road Closures

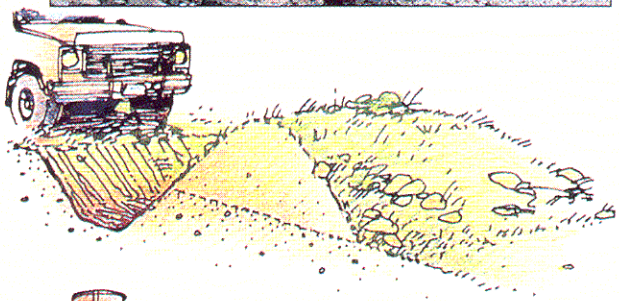
■ Upon completion of seasonal operations, the road surface should be crowned, outsloped, insloped, or cross-ditched. Remove berms from the outside edge where runoff is channeled. If possible, seasonally block the road.

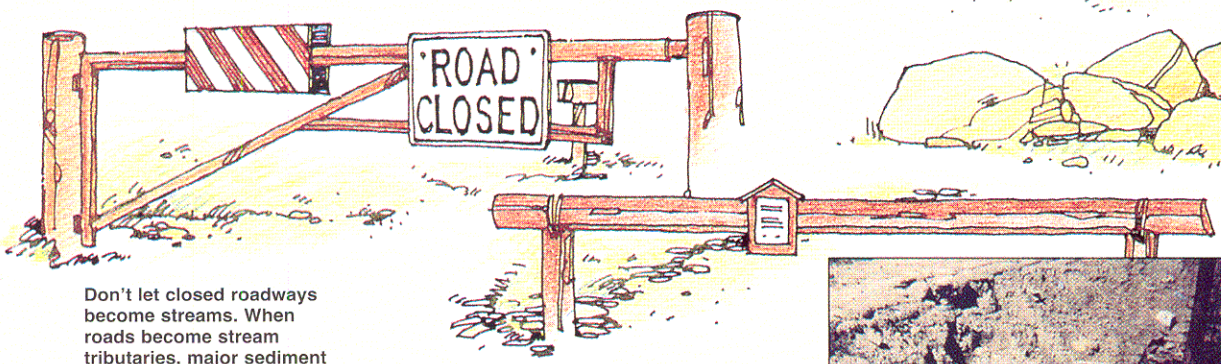
■ Leave abandoned roads in a condition that provides adequate drainage without further maintenance. Close these roads to traffic; pull culverts; reseed and/or scarify; and, if necessary, recontour and provide cross ditches or drain dips.

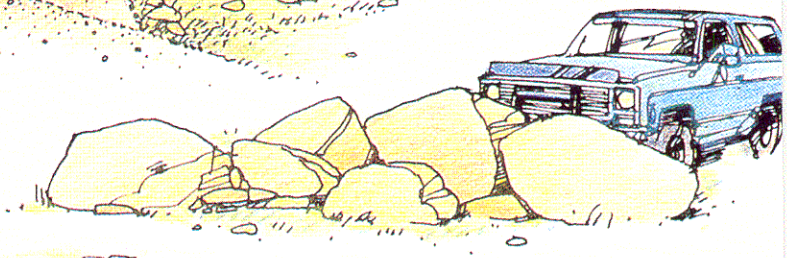
Complete road closures may appear to be a solution to costly road maintenance, but they also require the most preparation. Remember, water still runs on closed roads. The drainage system of closed roads needs careful thought and attention (see photos below).

The unauthorized use of traffic-controlled roads continue to be a problem for forest land owners. Damage to road surfaces can occur as easily by a pickup as it can by a log truck. Voluntary traffic control only works if everyone understands the reasons why and agrees to comply.

In many cases, physically blocking the access to roads may be necessary. Gates are used because they can provide temporary closure along with quick access if needed. Alternatives to gates include large berms or trenches, logs, stumps, or rock boulders. To prevent removal by vandals, gates and other barriers need to be well-anchored.

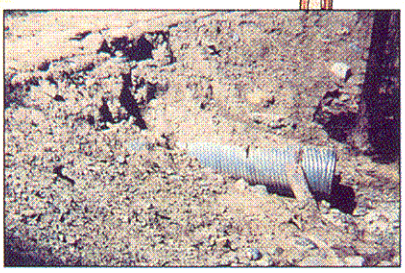




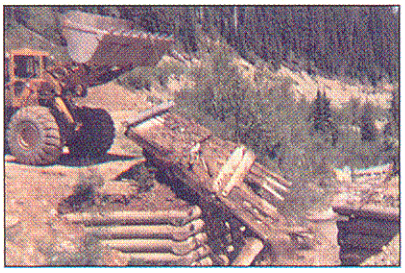


Don't let closed roadways become streams. When roads become stream tributaries, major sediment pollution can be the result. Outsloping the surface of closed roads can avoid this problem.

When involved in road closure, bridges present special problems. Unless plans include regular inspections of abutments for erosion and other potential problems, it may be best to remove all bridge structures.



While pulling culverts may prevent erosion problems, cross ditches may also be a solution. Space cross ditches more closely in areas that are more likely to erode (see page 24). When removing culverts, stockpile earth from the removal in a safe place where it can be recovered and won't erode. Reshape banks to a stable slope.



If the decision is to remove bridges and pull all culverts, it is also necessary to restore all drainage features to their natural condition. This includes reseeding of road surface and all cut and fill slopes.

STREAM PROTECTION ZONE

The SPZ is a mandated 75-foot minimum distance from a Class I stream, lake, or other water body that must be protected because of its special importance.

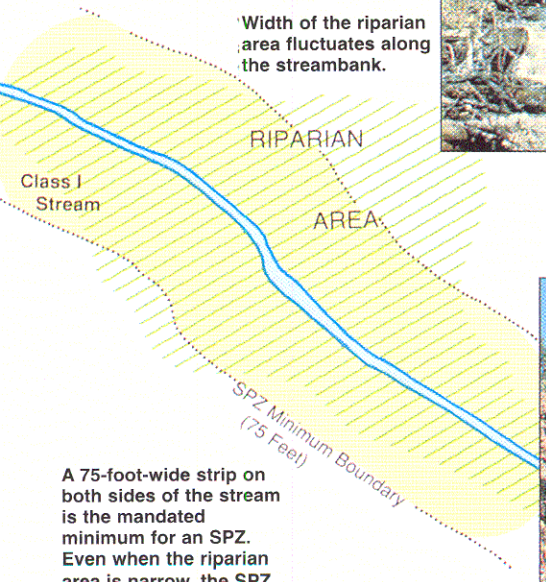
The function of an SPZ is to protect water quality along streams, lakes, and other water bodies. The riparian area "green zone" around streams, lakes reservoirs, springs, and seeps represents the area that stays green long into the summer months. Riparian areas usually have wet soils, high water tables, and can be identified by the presence of water-loving plants such as alder, willow, cottonwood, cedar, and spruce. Some intermittent streams and other water bodies, particularly in southern Idaho, may not show riparian areas, but they still have to be protected with an SPZ. Recognizing these areas and knowing where they are in the forest will make protecting water quality with an SPZ much easier.

The 75-foot minimum SPZ often extends beyond the riparian area "green zone." This is important when slopes near streams are steep and soils are unstable, or when the riparian area is narrower than 75 feet. Details concerning how to identify a stream, marking an SPZ, and when the SPZ should be more than the minimum are covered on page 18.

The unharvested side of this stream provides important stream shading. This helps maintain stream temperature.

SPZ extends beyond the 75-foot minimum where there are steep slopes or erosive soils.

The forest harvesting scene above presents some of the decisions facing loggers and forest landowners. Some decisions were made correctly. Others were not. (See captions.) Proper on-the-ground application of BMP's requires practice and personal judgment.



A 75-foot-wide strip on both sides of the stream is the mandated minimum for an SPZ. Even when the riparian area is narrow, the SPZ must be 75 feet.

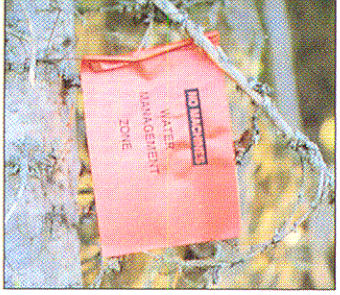
Inadequate SPZ for this stream.

What is there about SPZ's that needs improving?

Since 1985, comprehensive audits have been conducted on over 300 timber harvests across Idaho (see also page 4). Results indicated that a few SPZ's had poor overall ratings because water quality was not protected. The SPZ's were rated poorly, not because timber harvesting had occurred, but because BMP's were not applied properly, resulting in water quality damage. BMP's don't prohibit harvesting in SPZ's, but do call for care, to protect soil and water resources of the SPZ.

Specific problems cited in SPZ's included:

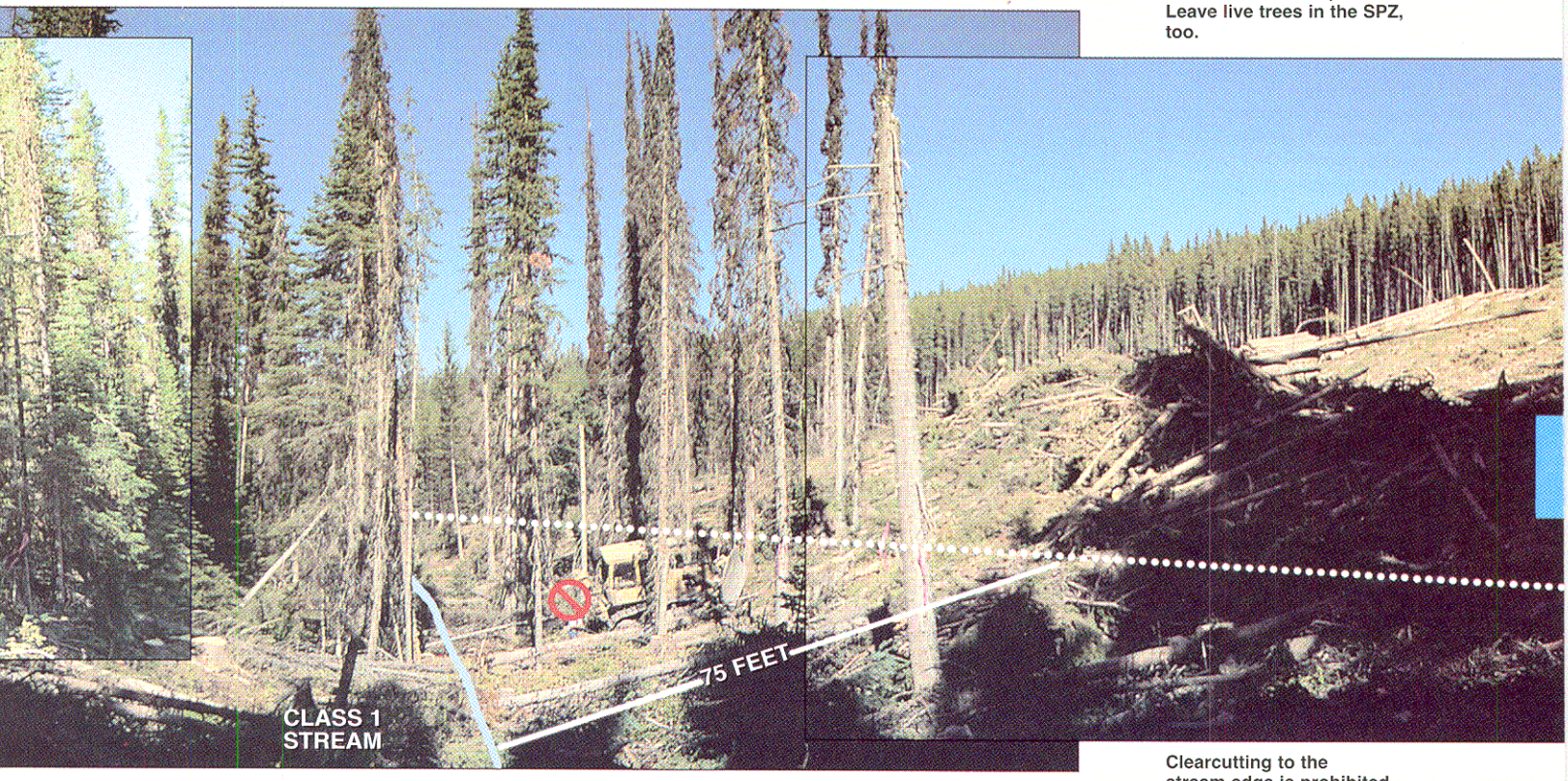
- Constructed roads and skid trails within SPZ's.
- Inadequate road drainage near streams.
- Logging slash left in the stream.
- Equipment operation in the SPZ's and wetlands was excessive.
- Improper use of broadcast or pile burning in SPZ's.



This well-marked SPZ has the required 75-foot minimum. However, wetlands next to streams often reach out beyond 75 feet. When this happens, the SPZ must reach out beyond 75 feet to protect wetlands. Watch for water-loving plants that indicate the extent of the wetland.

Equipment operation within an SPZ compacts moist soils, interferes with the filtering qualities of these soils, and damages vegetation.

Even though some of the trees left standing are dead, they are important when, over time, they fall across the stream and create pools. Leave live trees in the SPZ, too.



Leaving green slash in the stream reduces oxygen in the water and blocks fish access. This is prohibited.

Even Class 1 streams narrower than 1 foot wide must have a 75-foot minimum SPZ.

Avoid harvesting streambank trees. Such trees provide bank stability during peak runoffs.

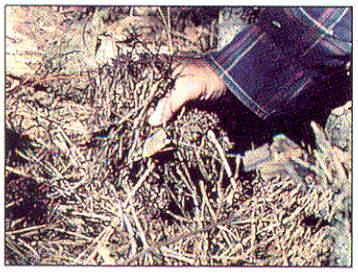
Clearcutting to the stream edge is prohibited along Class 1 streams.

■ The SPZ acts as an effective filter and absorptive zone for sediment.

1. The SPZ with its thick plant growth creates a mat of decomposing material on top of the soil. It is often damp because the water table is at or near the soil surface. The sponge-like qualities of the SPZ control the quantity of water flowing into the streams. Soils in this area absorb water during the wet seasons and slowly release moisture into the stream. This minimizes the effects of peak runoff and keeps streams from drying out sooner than usual.

2. The SPZ provides filtering of surface runoff. This filter acts as a trap, blocking sediment and other debris from entering the stream, lake, or reservoir. It catches and holds sediment in the mat of plants and duff. When this last line of defense isn't working, sediment ends up in the stream, causing water quality problems.

Since logging activity occurs in many of Idaho's watersheds, water quality must be protected by a healthy SPZ. Healthy SPZ's control the amount of water coming from a watershed. And we all depend on sediment-free water for household use, irrigation, and healthy fisheries.



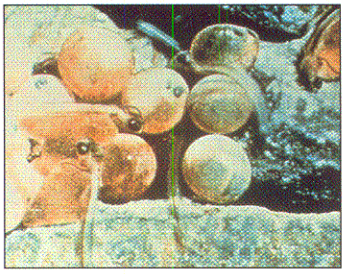
This thick, spongy SPZ carpet is the last line of defense, protecting stream water.

The SPZ maintains shade; conserves aquatic and terrestrial riparian habitats; protects the stream channel and banks; and promotes flood plain stability.

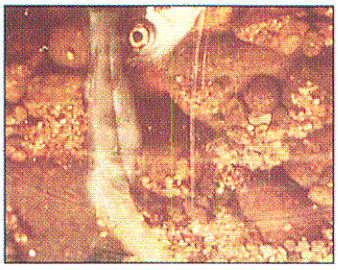
An adequate SPZ protects the absorptive and filtering action of the riparian area. The absorbent mat of forest humus, litter, and duff helps to trap sediment before it reaches the stream, ensuring good water quality.

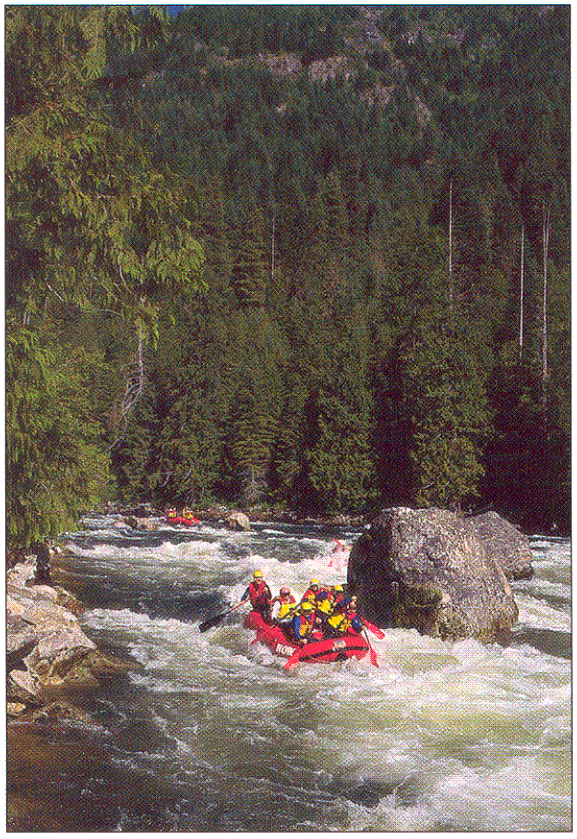
What's wrong with sediment in streams?

Trout and other fish reproduce by burying their eggs in stream-bottom gravel. The eggs develop in the gravel and hatch into "sac fry." When the yolk is absorbed, the young fish emerge from the gravel.



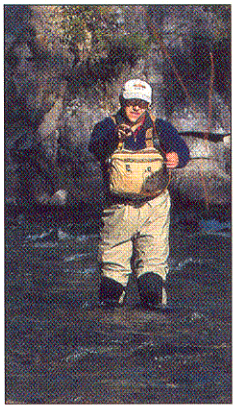
Sac fry and young fish can be choked by sediment. When too much sediment falls to the stream bottom, it fills the gaps between the gravel and suffocates the fish. The stream bed becomes cemented over. This tomb of sediment traps the young fish without clean water, oxygen, or food. For those fish that survive, the sediment has an abrasive effect on their sensitive gill tissue.





Sediment also kills aquatic insects and algae, fills in resting pools, and interferes with recreation.

Sport fishing is enjoyed by thousands of Idahoans, and generates substantial revenues for the state. Fish losses due to forestry activities can be minimized with healthy SPZ's.



Equipment Operation Waste

The Idaho Forest Practices Act doesn't allow waste from logging operations; such as crankcase oil, filters, or grease and oil containers, inside Class I or Class II stream protection zones.

Responsible operators also dispose of worn-out chokers, cable, replaced parts, welding and other machinery repair debris, paper or plastic packaging, lunch garbage, beverage cans, and other refuse away from forest operations.

Other SPZ Benefits:

SPZ's and stream shade.

Maintaining water temperatures helps fish spawning. Without trees and overhanging shrubs, stream temperatures would be higher in the summer and colder in the winter. Some fish species and aquatic organisms would then be unable to live in the streams. In the summer, cold water from shaded streams eventually flows into larger rivers and helps maintain their fish and aquatic life by keeping these waters cool all the way downstream.

SPZ's and food.

Leaves and insects drop into streams from overhanging trees and shrubs. In fact, 90 percent of the food in forested streams comes from bordering vegetation. Even in large rivers, over 50 percent of the food consumed by fish is from streamside trees and other vegetation.

SPZ's protect streambanks.

Many streambanks are stabilized by streambank trees. They anchor banks and prevent erosion during periods of high water. Removing trees and shrubs and substituting shallow-rooted grasses can lead to streambank collapse and stream sediment.

SPZ's and floods.

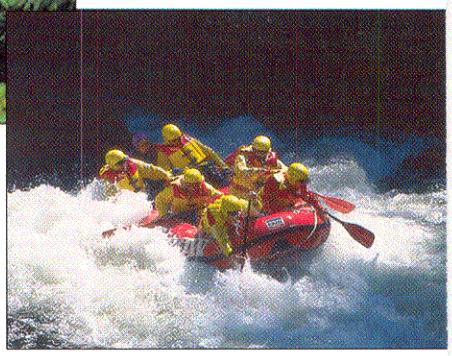
Healthy SPZ's stabilize floodplains. During times of high water, SPZ's reduce the velocity of floodwaters. Their dense vegetation and deep humus slow down racing waters. Forest floodplains suffer less damage when SPZ's are protected during logging activities.

Bank tree roots also supply important cover for fish.

Bank overhang is created by stream flows undercutting the stream bank and tree roots. Fish can rest, hide from predators, and feed in these protected areas.

Hundreds of animals and birds rely on SPZ's.

In the northern Rockies, 59 percent of the land birds use SPZ's for breeding. Of those birds, 39 percent can breed only in SPZ's. Others hunt in healthy SPZ's where food and cover are abundant. The reason is that SPZ's supply a great variety of plants needed by birds and other wildlife. Grasses, shrubs, vines, and trees all grow well in moist, fertile soil. Turtles, beaver, muskrats, and water snakes thrive in SPZ's. Deer, wood duck, and bear feed and seek cover in the thick vegetation. Eagles, owls, and songbirds occupy the trees. Pools supply breeding sites for frogs, toads, and insects. SPZ's are also well-traveled wildlife corridors, connecting one area with another.

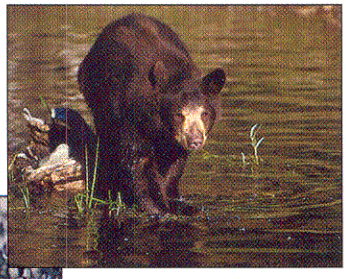


SPZ's and humans.

We like SPZ's too, for a lot of reasons. The recreational activities that we enjoy in and around streams are many. The financial value of healthy SPZ's to the people of Idaho is large enough for all of us to be careful when we do anything in and around them.

SPZ's and timber production.

For those who grow and harvest trees, the fact is that trees often grow best in riparian areas. Trees respond to those deep, fertile, and moist soils. SPZ's are not timber harvest "keep out" zones. But they are locations where timber harvesting activities must be modified to protect the many benefits mentioned above.



SPZ Boundaries

- Designate streamside protection zones to provide stream shading, soil stabilization, sediment and water filtering effects, and wildlife habitat.
- "Stream" means a natural water course of perceptible extent with definite beds or banks that confine and conduct continuously or intermittently flowing water.
- Definite beds are defined as having a sandy or rocky bottom that results from the scouring action of water flow.
- The SPZ encompasses a strip at least 75 feet wide on each side of a Class I stream, measured from the ordinary (yearly average) high-water mark or definable bank. The SPZ on a Class II stream is 30 feet or more away from the ordinary high water marks. An exception is on Class II streams that do not drain into Class I streams; then the SPZ is five feet.
- The width of the SPZ can extend beyond the 75-foot minimum to include wetlands along the stream bottom and to provide additional protection in areas of steep slopes or erosive soils.
- Consult with forestry professionals, soil and water conservation specialists, or biologists if assistance is needed in setting appropriate SPZ boundaries.

Setting SPZ Boundaries

To be sure equipment operators have no question about the SPZ boundary, it should be clearly marked. Plastic flagging, paint, or signs should be used at frequent intervals.
The purpose of marking an SPZ is to be sure everyone working around a stream, lake, or other body of water knows the extent of the protected area.

These areas require an SPZ of no less than 75 feet. It is measured from the ordinarily high-water mark or definable bank. Watered streams are easy to identify, intermittent streams can be more difficult to identify during dry periods. Whether wet or dry, perennial or intermittent, during droughty or rainy years, streams must be protected with an SPZ.

One reason for a wider SPZ is when a wetland lies adjacent to a stream, individuals must be aware of wetlands by watching for water-loving plants. In these cases, the SPZ must loop out to include any wetland and provide protection. Proper SPZ location requires practice and per-sonal judgment.

What is a wetland?

Wetlands include seeps, springs, wallows, marshes, and bogs (see pages 2 and 3). They collect and hold water.

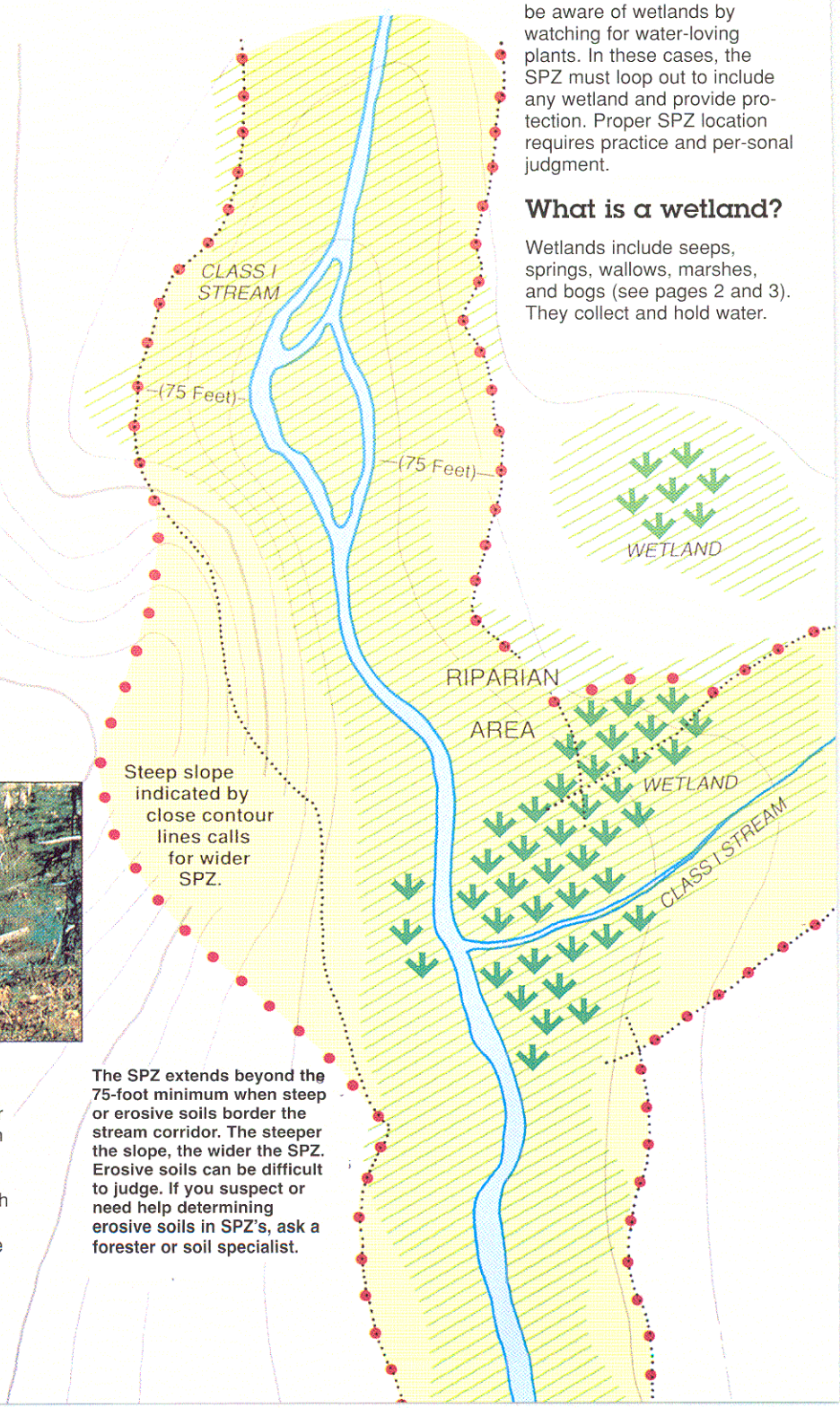
What is a stream?

A stream can be identified in one of two ways. A stream must have a sandy or gravel bottom, the result of flowing water. Or a stream must have definite banks that restrict water.

When no definite bank is apparent, watch for where sand or gravel stops and soil begins at the edge of a stream.

Is this a stream?

No. There is no rocky bottom or identifiable banks. But this is an ephemeral area, part of the watershed collection system, that may carry water during high flows. Disturbed soils in these areas can create sediment (see page 2). Care should be taken when logging.



The SPZ extends beyond the 75-foot minimum when steep or erosive soils border the stream corridor. The steeper the slope, the wider the SPZ. Erosive soils can be difficult to judge. If you suspect or need help determining erosive soils in SPZ's, ask a forester or soil specialist.

Consider the following practices when harvesting timber in and around the Stream Protection Zone.

The SPZ is not a "No logging" zone. But because of its values, timber harvesting from SPZ's should be done with special care.

Trees are important to a healthy SPZ.

■ Leave 75 percent of the existing shade adjacent to streams; hardwoods, unmerchantable conifers and shrubs.

Protect SPZ's

■ Maintain sufficient ground cover to trap sediment.

This vegetation is the filter that keeps sediment from reaching the stream. If it gets torn up during harvesting, it cannot do the job. Skidders and tractors must stay out of SPZ's.

Especially important are stream bank trees and shrubs. They anchor the bank, shade the stream, provide food, supply cover for fish, and habitat for birds and other wildlife.

Leave snags, and defective and sub-merchantable trees in SPZ's. They are habitat for many birds and animals.

■ Equipment is not allowed in SPZ's or wet areas.

■ Suspend the lead end of the log during skidding whenever possible. Logs should be fully suspended when skyline skidding across a stream and immediately above streambanks. Avoid ground skidding in wet areas.

■ Whole-tree or tree-length yarding can reduce the need for slash disposal in the SPZ.

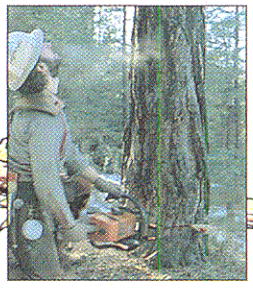
Site preparation near SPZ's

■ Steep slopes containing material that could roll down-slope and fall into a stream during burning should receive special attention.

■ Protect the SPZ with a slash free strip within the SPZ by whole tree harvesting.

Harvesting in the SPZ

Directional falling and/or mechanical feller-bunchers allow removal of some SPZ trees without damaging the SPZ.



Never operate equipment on stream banks or in wetlands. It can damage the fragile SPZ (see page 15).

■ Use directional falling for harvest operations in the SPZ or wetlands. Avoid falling trees in streams or water bodies. Limb or top trees above the high water mark.

■ Consider hand-scalping and planting within the SPZ.

Keep slash out of water bodies by removing limbs and tops well above the stream high-water mark. Rotting slash uses up oxygen, robbing it from fish and other aquatic animals.

Eventually, bank trees fall across the stream, helping to create a stair-step of pools in the stream channel, providing an essential fish habitat component. The larger the bank trees, the better.

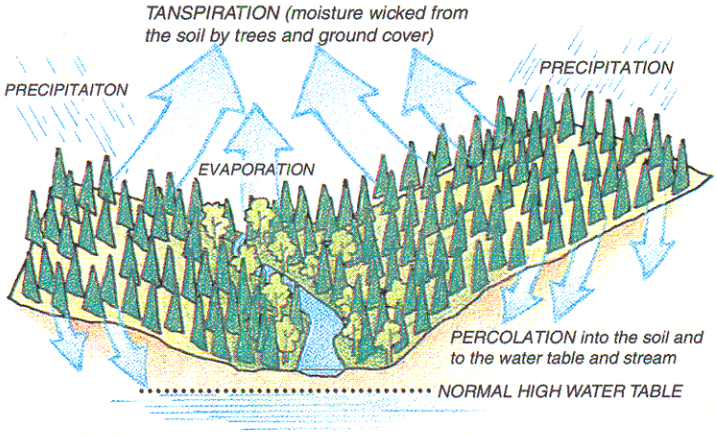
■ Retain trees necessary for bank stabilization and as a future source of large woody debris to the stream channel.

Conifer Regeneration

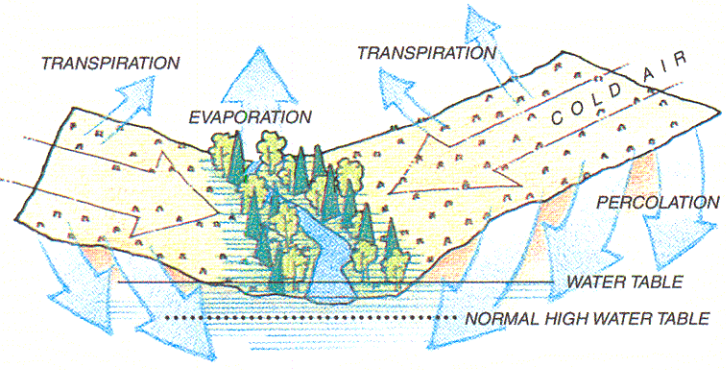
■ Recognize that in some soil and drainage types, clear-cutting can cause marked increases in the water table, cold-air ponding, and grass/shrub competition. All of these factors can inhibit conifer regeneration.

■ To avoid potential regeneration problems, leave some mature trees.

Trees act as a buffer. Except for times of extreme precipitation and runoff, trees help maintain the normal water table along streams. They are like wicks, pumping water from the soil and releasing it onto the air through leaves and needles (transpiration). Of course, some soil moisture seeps (percolates) underground, slowly reaching the stream channel.



Below is the same drainage after hillside trees are harvested. The "wicks" have been removed, transpiration is reduced and percolation is increased, at least until vegetation recovers.



In the meantime, to avoid the following consequences, always leave some mature trees in the SPZ.

1. **Removing trees can lead to cold-air ponding. This extends winter's cold temperatures into early spring and hinders conifer regeneration in the SPZ.**
2. **Removing trees can raise the streamside water table, which makes soils too wet for conifer regeneration.**
3. **These wet soils result in grass and shrub invasion, which chokes out conifer regeneration in the SPZ.**

Stream Protection Rules

Idaho Forest Practices Act

During and after forest operations, stream beds and streamside vegetation shall be protected to leave them in the most natural condition as possible to maintain water quality and aquatic habitat.

Ground-based skidding in or through streams shall not be permitted. When streams must be crossed, adequate temporary structures to carry stream flow shall be installed. Cross the stream at right angles to its channel if at all possible. (Construction of hydraulic structures in stream channels is regulated by the Stream Channel Protection Act - Title 42, Chapter 38, Idaho Code). Remove all temporary crossings immediately after use and cross-ditch the ends of the skid trails.

When cable yarding is necessary, across or inside the stream protection zones, it shall be done in such a manner as to minimize stream bank vegetation and channel disturbance.
Provide the large organic debris (LOD), shading, soil stabilization, wildlife cover, and water filtering effects of vegetation along Class I streams.

Leave hardwood trees, shrubs, grasses, and rocks wherever they afford shade over a stream or maintain the integrity of the soil near a stream.

Leave 75 percent of the current shade over Class I streams.

Carefully remove the mature timber from the Stream Protection Zone to prevent destruction of shade and vegetation filters.

Standing trees including conifers, hardwoods, and snags will be left within 50 feet of the ordinary high water mark on each side of all Class I streams in the following minimum numbers per 1,000 feet of stream:

Minimum Standing Trees per 1,000 Feet Required (each side)

Tree Diameter (DBH)	Class I Stream Width Over 20'	Class I 10'-20'	Class I Under 10'	Class II*
3 - 7.9"	200	200	200	140
8 - 11.9"	42	42	42	—
12 - 19.9"	21	21	—	—
20" +	4	—	—	—

• Provide soil stabilization and water filtering along Class II streams that flow into Class I streams for 30 feet each side of the SPZ. No standing trees are required for Class II streams with the 5-foot SPZ.

Snags will be counted as standing trees in each diameter class if snag height exceeds 1.5 times the distance between the snag and the stream's ordinary high water mark. Not more than 50 percent of any class may consist of snags.

As an alternative to the standing tree and shade requirements, the operator may notify the department that a site specific riparian management prescription is requested. The department and operator may jointly develop a plan, upon consideration of stream characteristics and the need for large organic debris, stream shading, and wildlife cover, which will meet the objective of these rules.

Where the opposite side of the stream does not currently meet the minimum standing tree requirements of the table, the department and the operator should consider a site specific riparian prescription that meets the large organic debris needs of the stream.

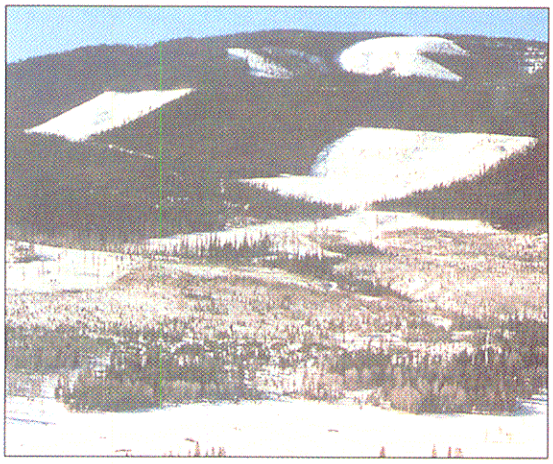
Stream width shall be measured as average between ordinary high water marks.

TIMBER HARVESTING

Harvest Design

■ Use the logging system that best fits the topography, soil type, and season, while minimizing soil disturbance and economically accomplishing silvicultural objectives.

Consider cumulative watershed effects.



Protect wildlife habitat.

Plan for a prompt new forest.

Timber harvest planning is more than deciding how to cut trees. The harvest design must consider the long-term effects of harvesting on increasingly important resources.

Cumulative watershed effects.

What are the effects of this harvest when combined with other activities in the same watershed? Will there be a combined detrimental effect on water yield and sediment?

What are the potential effects of the harvest on water quality?

Soil erosion hazard: Some soils are more prone to erosion. Help is available to identify erosion hazard.

Rainfall: its seasonal pattern and total amount.

Topography: Where are slopes, drainages, streams, and other physical features located? Are there critical areas that will require special attention?

Wildlife habitat protection.

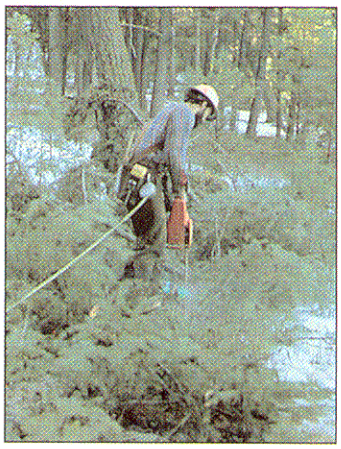
How will the harvest affect wildlife habitat? Eliminating elk habitat, for example, may displace elk use of the area.

Plan for a prompt new forest.

Are there other plants, in addition to trees, that indicate special precautions about the harvest area? What kind of forest will be grown after the harvest and how quickly will the site be reforested?

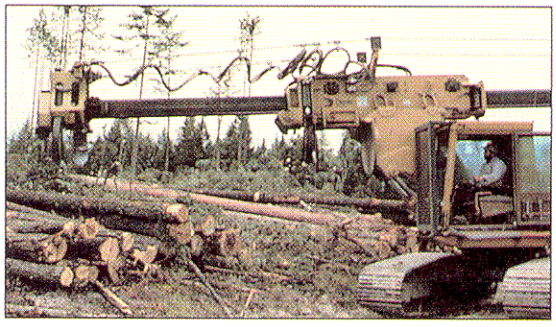
Trees left for future harvest must be of sufficient vigor and acceptable species to ensure continuous growing and harvesting. They must also be protected from damage, to enhance their survival and growth.

Characteristics of the harvest sites — in particular terrain — influence the choice of a logging system. On gentle terrain, tractors and skidders, or even horses, are a logical choice. In Idaho forests, ground-based skidding equipment is common.



Left: Whatever the harvest system — skidders or skyline — the power saw and **skilled operators** are crucial.

Below: **Feller-bunchers** are mechanical harvesters that move through the forest and harvest trees and pile them in bunches. They can reach into sensitive areas and thin individual trees without damaging remaining trees, water, soils, or wildlife habitat.



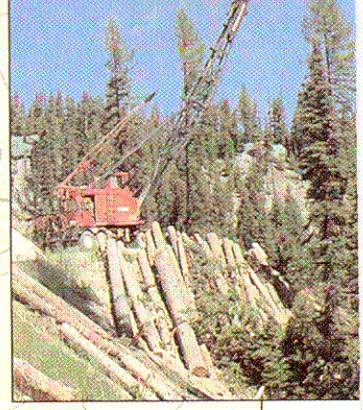
Above **Slide-boom delimbers** begin the manufacturing process right in the forest. They quickly snip off the branches and cut the stem into exact lengths.

Skyline and cable harvesting (below) are used on steep slopes where ground-based equipment cannot operate. These machines are capable of reaching out a quarter mile, lifting logs off the ground and moving them to a landing where they are hauled away.

Whatever harvest system is chosen, it must protect the long-term resource values of the forest.

■ Use the economically feasible yarding system that will minimize road densities.

■ Consider the potential for erosion and possible alternative yarding systems before planning tractor skidding on steep or unstable slopes.



The topographic map (above) indicates steep terrain. A skyline harvest system is a good choice. This system eliminates the need for skid trails because the logs are moved to the landing by an aerial cable (skyline). By suspending logs in the air, skyline systems reduce soil disturbance. This harvest system is more expensive than ground skidding, but is used where long, steep slopes are common. When harvesting is completed, skyline harvest areas are easily recognized by the skyline corridors. Once the timber is removed the area can be regenerated and a new forest is free to grow.

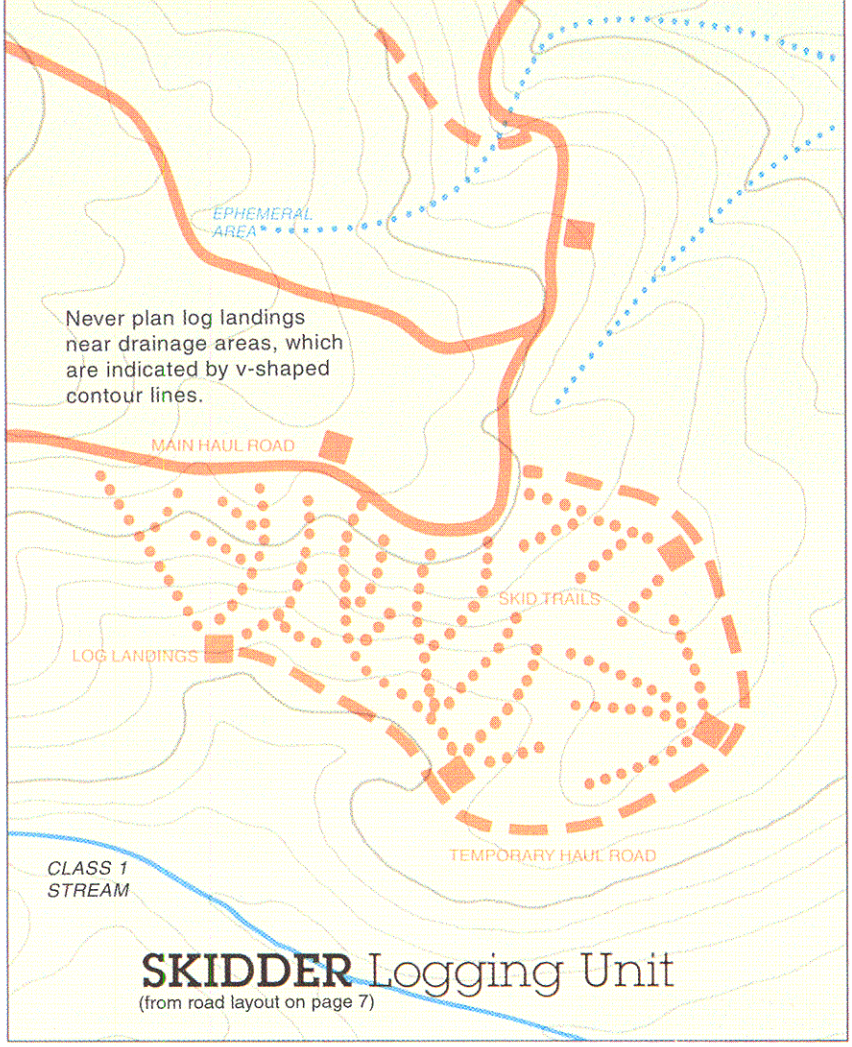
The forest land pictured in the topographic maps above is the same land pictured on page 7. Here, it is used to illustrate timber harvesting BMP's. Looking back at the map on page 7, you can see the steep canyon pictured above and in the mountain top bench shown on the topographic map on the next page. The contour lines indicate the contrast between the two locations. Terrain differences like this call for harvest techniques that consider the potential for erosion and its impact on water quality.

A skyline harvesting system is planned for the steep canyon above. A perennial stream runs down the canyon and drains into a wetland at the toe of the slope. The skyline will operate from the road, using a suspended cable to reach down the hillside and pull suspended logs up to the road (dotted lines indicates the planned cable settings). Log landings are planned along the road. These small landings reduce the need for extensive excavation to carve out flat areas to pile logs. Notice that the harvest plan shows the boundary of the SPZ along the perennial stream, and includes the wetland at the toe of the hillside. The skyline makes it possible to harvest timber in the SPZ without disturbing the soil. Individual trees can be removed from the SPZ without the risk of damage to water quality.

When the terrain is more gentle, like that shown in the topographic map on the next page, other harvesting options are available. The harvest plan for this mountain bench calls for ground-based skidding equipment, pictured in the far right photo. The slope is less than 30 percent and well suited to skidding equipment. A temporary access road (dashed line) is planned to come off the main haul road. It skirts around the outer edge of the bench and allows downhill skidding to the marked log landings along the road.

Designated skid trails are planned for this unit (dotted lines on the map). Pre-planned skid trails limit soil disturbance and any potential soil compaction. They should also be designated to avoid natural drainage areas. Skidding equipment is limited to these designated trails rather than "go-anywhere" trails (see diagram, page 23). Try to confine the area covered by skid trails and landings to less than 15 percent of the total unit.

Regardless of the harvest system you choose, being able to grow the next forest depends on protecting the soil.



SKIDDER Logging Unit
(from road layout on page 7)

TIMBER HARVESTING

■ Design and locate skid trails and skidding operations to minimize soil disturbance. Using designated skid trails is one means of limited site disturbance and soil compaction.

When designated skid trails are compared to "go anywhere" skid trails, there is little difference in winching, but a large difference in the area covered by skid trails

Research and field experience indicate that designated skid trails may be only slightly more expensive, or even less expensive, than "go anywhere" skid trails.

As much as 40 percent of an area may be covered with skid trails if they are not planned and marked in advance.

Soil disturbance (left) can reduce the soil's ability to grow trees. Avoid "go anywhere" skid trails that result in erosion and reduced water quality.

Poor location of log landing. Logs are being skidded across drainage.

■ Minimize the size and number of landings to accommodate safe, economical operation.

■ Avoid locating landings that require skidding across drainage bottoms.

■ Locate skid trails to avoid concentrating runoff and provide breaks in grade.

■ Locate skid trails and landings away from natural drainage systems and divert runoff to stable areas.

■ Limit the grade of constructed skid trails on geologically unstable, saturated, highly erosive, or easily compacted soils to a maximum of 30 percent. Use mitigating measures, such as cross ditches and grass seeding, to reduce erosion on skid trails.

Maintain Productivity and Related Values

Where major scenic attractions, highways, or recreational areas traverse forest land, give them special consideration by prompt cleanup and regeneration. Also give special consideration to preserving critical wildlife or aquatic habitat. Wherever practical, preserve fruit, nut, and berry trees or shrubs. Plan clear cutting operations so that adequate wildlife escape cover is within 1/4 mile.

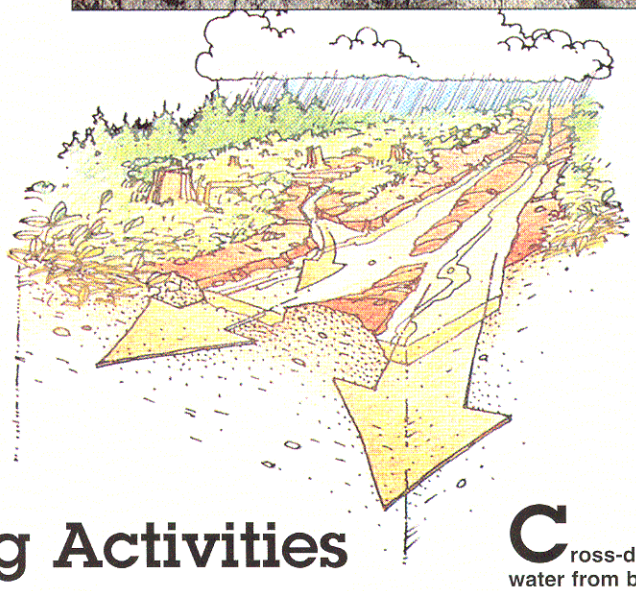
Avoid conducting operations along bogs, swamps, wet meadows, springs, seeps, draws, or other wet areas, leave buffer strips to protect soil and vegetation from disturbances that damage water quality and quantity, aquatic habitat, and wildlife.

■ Tractor skid when compaction, displacement, and erosion will be minimized.

■ Avoid tractor or wheeled skidding on unstable, wet or easily compacted soils and on slopes that exceed 45 percent unless operation can be conducted without causing excessive erosion. Limit the grade of constructed skid trails to a maximum of 30 percent.

■ Avoid skidding with the blade lowered.

Forest soils on steep slopes are often shallow. Scalping off the litter layer removes the soil's protective cover, leaving it exposed to erosion. Don't use the blade as a brake or to improve traction for skidders on steep slopes.



What happens when the forest litter layer is scraped off?

■ Nutrients for the next crop of trees are removed.

■ Mineral soil is exposed to erosion by rainfall and surface flow.

■ Soil does not retain moisture as well.

■ Ability of the soil to grow trees is reduced.

Other Harvesting Activities

■ Stabilize or reclaim landings and temporary roads on completion of use.

Ditches, cross ditches, or outsloping can prevent water accumulation on landings. Be sure to cross-ditch skid trails leading down to landings.

■ For each landing, skid trail, or fire trail, provide and maintain a drainage system to control the dispersal of water and to prevent sediment from entering streams.

■ Install necessary cross-ditches on tractor skid trails. Appropriate spacing between cross-ditches is determined by the soil type and slope of the skid trails. Timely implementation is important.

■ When natural revegetation is inadequate to prevent accelerated erosion before the next growing season, apply seed or construct cross-ditches on skid trails, landings, and fire trails. A light ground cover of slash or mulch will retard erosion.

Cross-ditches divert surface water from bare soil to areas where it will not cause erosion. They should be constructed on roads, landings, and skid trails (pictured). Cross-ditches can be constructed with a shovel, but mechanical equipment is most common. Cut the cross-ditches into solid soil, at least 8 inches deep. Shape the berm, parallel to the cut, at least 12 inches above the skid trail grade. Construct the cut downward, but not more than at a 45 degree angle, so water runs to the outlet. Be sure the cross-ditch is open at the lower end so water runs out. Water should flow onto slash, vegetation, or rocks. When temporary spur roads are cross-ditched, be sure to connect the waterbar into "cutslope" to intercept all surface flow.

Recommended Cross-ditch Spacing Distance for Roads and Skid Trails

Grade of Road or Trail (5)	Unstable Soils (High Erosion Hazard)	Stable Soils (Low Erosion Hazard)
2 -	135'	170'
5	100'	140'
10	80'	115'
15	60'	90'
20	45'	60'
25+	30'	40'

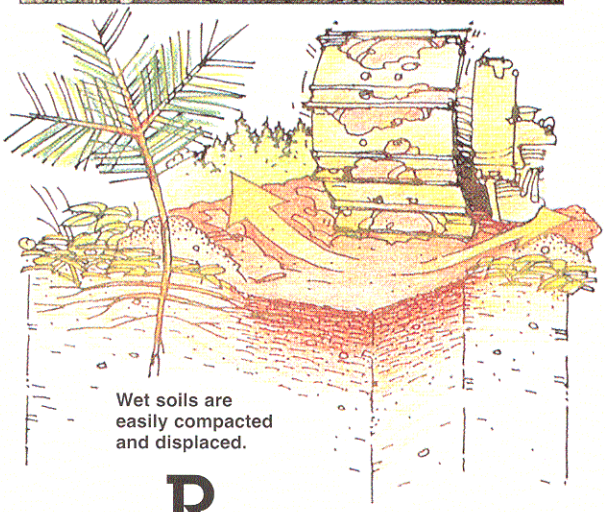
Intervals in feet.

Slash Treatment and Site Preparation

The question. "How much soil exposure is enough?" is common when preparing a site for a new forest. Clean as a parking lot (below) is too much. New forests need the nutrients and protection supplied by logging slash. Soil compaction is another problem with sweeping the forest clean.

When you pick up a handful of forest soil, half of it is solid material. The rest is empty pore space that holds water and air. Heavy equipment can squeeze soil pores, reducing the space for water and air for trees need water and air for growth, the start of the next forest can suffer from soil compaction.

Certain soil conditions are more likely to lead to compaction. Wet soils are more compactible than dry. The most severe compaction occurs within a few inches of the surface. Unfortunately, that's where seed germination occurs and where most of the water-absorbing tree roots are found.



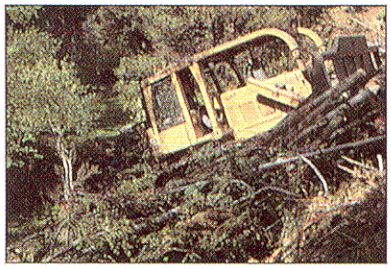
Wet soils are easily compacted and displaced.

Regeneration of a new forest often requires the removal of some logging slash. Seed from nearby trees germinates best in exposed mineral soil. Scarification must expose bare soil for new seedlings, while avoiding erosion. The three scenes below show mechanical scarification; inadequate (top), acceptable (middle), and excessive (bottom).

The law requires fire hazard reduction of slash. In the two scenes below, one shows acceptable slash reduction (top); the other is not acceptable because too much fire hazard was left.

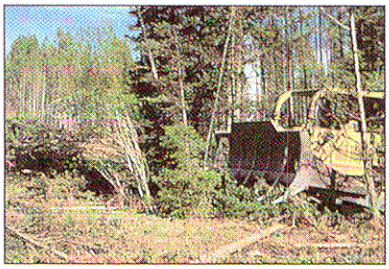
■ Use brush blades on dozers when piling slash. Avoid use of dozers with angle blades.

■ Scarify the soil only to the extent necessary to meet the reforestation objective of the site. Site preparation equipment producing irregular surfaces is preferred. Care should be taken to preserve the surface soil horizon.



Slash from log processing should never be cast into the SPZ.

■ Low slash and small brush should be left to slow surface runoff, return soil nutrients, and provide shade for seedlings.



Work around existing small trees and low brush.

■ Carry out brush piling and scarification when soils are frozen or dry enough to minimize compaction and displacement.

Stay clear of wet areas during scarification. Results like this create compaction and water quality problems.

■ Minimize or eliminate elongated exposure of soils up and down the slope during mechanical scarification. Carry out scarification on steep slopes in a manner that minimizes erosion.

Machine-made ruts on hillside soils can easily become channels for surface water erosion.

- Remove all logging machinery debris to proper disposal site (tires, chains, chokers, cable, filters, oil cans and miscellaneous discarded parts).
- Limit water quality impacts of prescribed fire by constructing cross-ditches in firelines; not placing slash in drainage channels; and maintaining the streamside management zone. Avoid intense fires unless needed to meet silvicultural goals.
- Prescribed burning and/or herbicide application is the preferred means for site preparation, especially on slopes greater than 40 percent.
- FPA requires reforestation of harvested areas to re-establish protective vegetation or restock forest tree species within five years after harvesting reduces the stocking below the levels in the table below.

On steep slopes, prescribed burning can be used to prepare a new forest. By carefully monitoring moisture conditions, a fire can be set that consumes only part of the material, leaving the soil humus and large logs undisturbed. A helitorch (Above) lights spot fires designed to burn quickly. Afterwards, the site is either planted or allowed to seed-in naturally.

Chemical application eliminates the problems of compaction and soil disturbance caused by machines. Seedlings may be hand planted and herbicides sprayed to control competing vegetation and help young trees get established.

Site preparation techniques — mechanical, prescribed burning, and chemical — are designed to get the new forest off to a vigorous start. When combined with healthy tree seedlings, either planted or naturally seeded, the result is the next generation forest.

Reforestation Requirements
Idaho Forest Practices Act

Minimum stocking after harvest; Acceptable Trees

Average Size Class DBH - Inches	Average Number Trees Per Acre	Average Spacing in Feet
2.9 and smaller	170	16 x 16
3.0 and greater	110	20 x 20
5.0 and greater	60	27 x 27
8.0 and greater	35	35 x 35
11.0 and greater	20	47 x 47

Supplemental reforestation may be required three growing seasons after harvest, if the Department of Lands determines that stocking levels do not meet the above standards. Reforestation must be completed before the end of the fifth growing season after harvest.

Some lands are exempted from reforestation requirements: (1) noncommercial forest lands; (2) lands being converted to nonforest use; (3) a forest practice that will result in 10 acres or less below minimum stocking levels.

Prescribed Fire

Using fire for forestry purposes requires a valid Forest Practices Notification. Scattered or piled slash should be cured and free of dirt or stumps to minimize air pollution. All burning for forestry purposes should be planned and prescribed to be within air quality guidelines.

Winter Activities

Winter Harvesting Considerations

Idaho's winter freeze-up brings the opportunity for low impact logging. With proper precautions, even work in sensitive areas can be done without affecting water quality.

To reduce the risk of erosion and damage from roads and constructed skid trails in winter logging:

■ Install adequate surface and cross drainage in roads to be used for winter operations before operations.

■ Drain winter roads by installing rolling dips, drivable cross ditches or open top culverts, outsloping, or by other suitable means.

■ During winter operations, maintain roads as needed to keep the road surface drained during thaws and breakup. This may include:

- Actively maintaining existing drainage structures;
- Opening drainage holes in snow berms;
- Installing additional cross drainage on road surfaces by ripping, placing native material, or other suitable means.

■ Before logging, mark existing culverts. Keep culverts and ditches open.

■ Be prepared to suspend operations if conditions change rapidly and serious erosion hazards develop.

Before logging, mark existing culverts and other drainage structures. Keep drainage open and culverts unplugged.

SPZ's can be totally obscured by heavy snow. Avoid confusion by marking boundaries ahead of the first snow.

Compact skid trail snow before skidding logs. This avoids damage to soils that are still wet or not completely frozen.

Winter thaws can happen. Don't take chances with soil disturbance and possible erosion. Expect to shut-down temporarily.

Cross-ditch all skid trails before spring runoff. If prohibited by frozen ground, install cross-ditches during dry summer months. Temporary erosion control barriers consisting of slash can be used until cross-ditches are installed.

Winter Road and Drainage Considerations

■ For road systems across areas of poor foundation, consider hauling only during frozen periods.

To provide a winter road grade capable of heavy hauling, always remove snow cover. Deep-frozen road surfaces have tremendous strength. Don't let snow cover insulate and weaken the road — plow during cold weather.

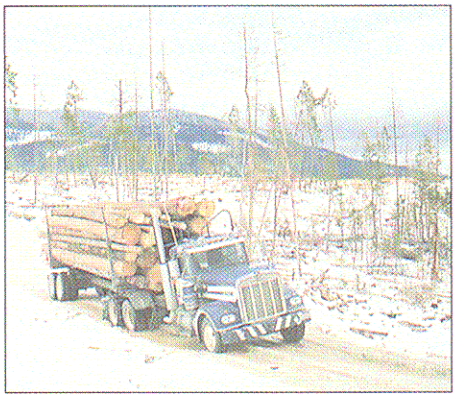
■ During cold weather, plow any snow cover off of the roadway to facilitate deep freezing of the road grade before hauling.

■ Use compacted snow for road beds in unroaded, wet, or sensitive sites. Construct snow roads for single-entry harvests or for temporary roads.

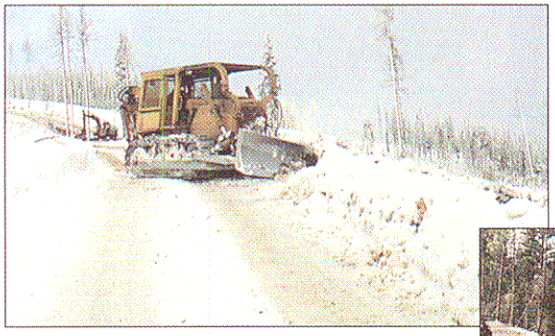
■ After completion of snow road use, restore stream crossings to near pre-road conditions to prevent ice dams. Do not use the stream channel for the roadway except for crossings.

■ Be prepared to suspend operations if conditions change rapidly and when the erosion hazard becomes high.

This is a poor job of restoring a temporary snow road stream crossing. This work should be completed before stream flows begin. In addition to the streambed, it appears that stream bank and SPZ damage is occurring.



Road surfaces deteriorate rapidly under heavy hauling and thawing temperatures. This road surface is starting to break up. Hauling should be suspended, or limited to colder portions of the day.



■ When plowing snow for winter timber harvest, provide breaks in snow berm to allow road drainage.

Snow berm breaks allow for spring drainage without damaging the road surface.

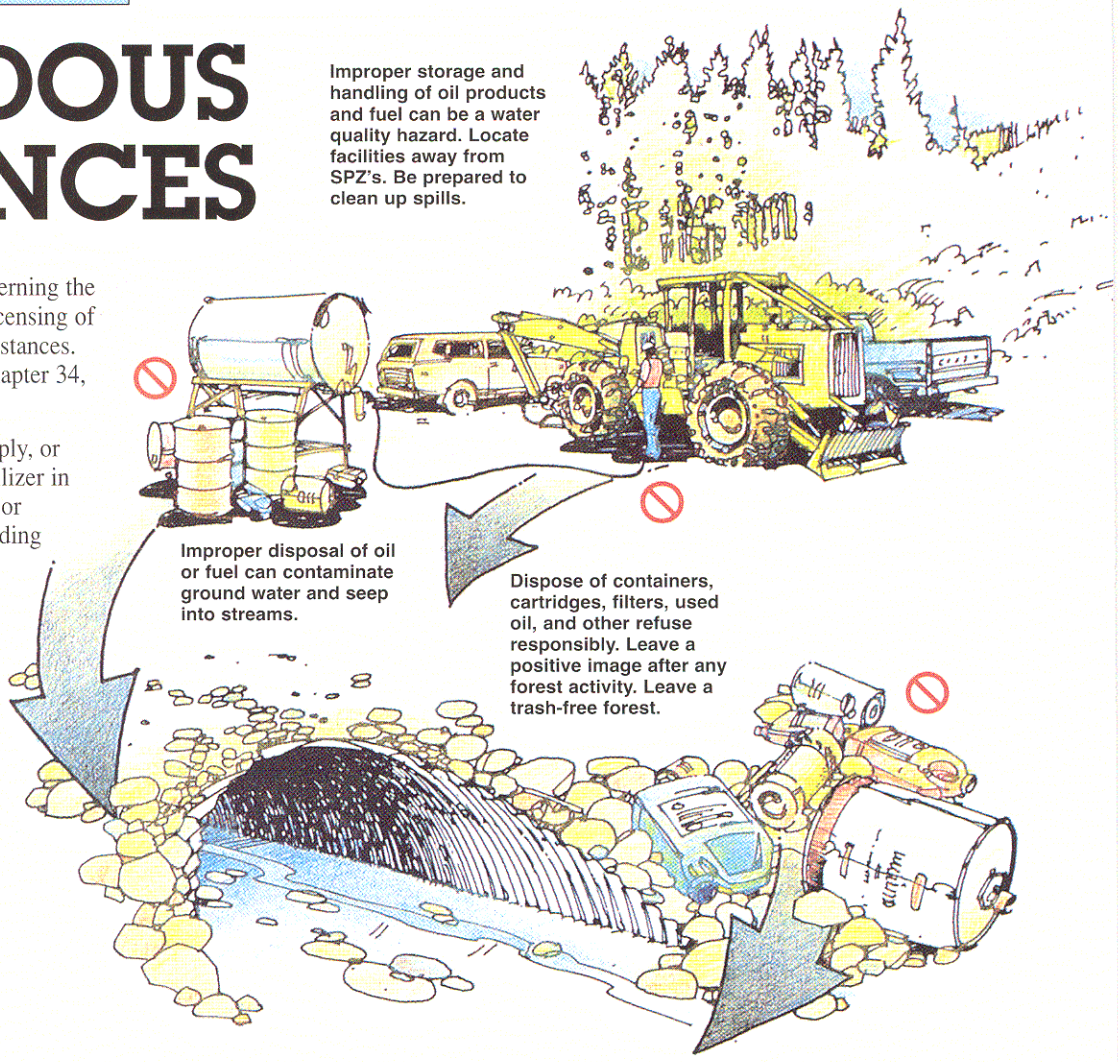
HAZARDOUS SUBSTANCES

■ Know and comply with regulations governing the storage, handling, application (including licensing of applicators), and disposal of hazardous substances. (Refer to Idaho Pesticide Law, Title 22, Chapter 34, Idaho Code).

■ Do not transport, handle, store, load, apply, or dispose of any hazardous substance or fertilizer in such a manner as to pollute water supplies or waterways, or damage or injure land, including humans, desirable plants, and animals.

■ Do not store, mix, or rinse hazardous substances or fertilizers in the Stream Protection Zone or where they might enter state waters.

■ Develop a contingency plan for hazardous substance spills, including cleanup procedures and notification of the Idaho Division of Environmental Quality.



Pesticides and Herbicides

■ Use an integrated approach to weed and pest control, including manual, biological, mechanical, preventative, and chemical means.

■ To prevent the entry of hazardous substances into surface waters:

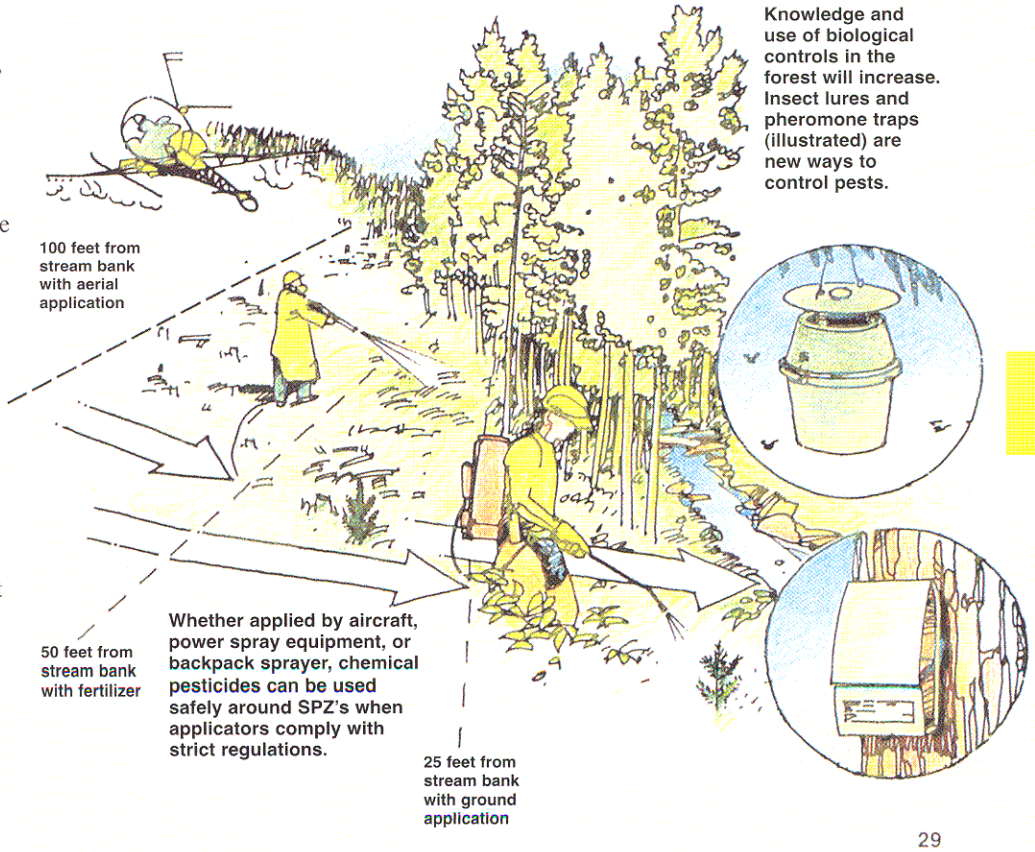
A. Chemical treatments within the streamside management zone shall be by hand and shall be applied only to specific targets.

B. Leave a 25-foot buffer along surface waters when chemicals are being applied through ground application with power equipment.

C. For aerial application, leave at least a 100-foot buffer along live water and do not spray in the SPZ.

D. Always refer to chemical label instructions for additional guidance on use near water and required buffer zones.

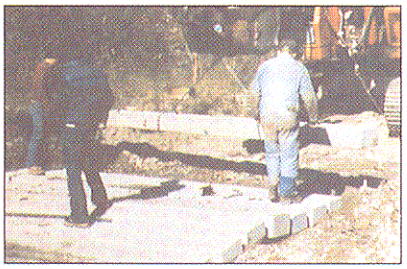
■ To enhance effectiveness and prevent transport into streams, apply chemicals during appropriate weather conditions (generally calm and dry) and during the optimum time for control of the target pest or weed.



STREAM CROSSINGS

Legal Requirements

- The Stream Channel Protection Act of 1971 (Title 42, Chapter 38, Idaho Code) requires that a permit be obtained from the Idaho Department of Water Resources (IDWR) for any alterations within the beds and banks of continuously flowing natural streams in Idaho.
- Before any work starts, the party intending to alter a stream channel must complete a **Joint Application** form for use by the Idaho Department of Water Resources, and, where needed, the Department of Lands and the U.S. Army Corps of Engineers.
- IDWR routes applications to the other agencies, when needed, and issues the permit.
- Permanent or temporary stream crossing structures, fords, riprapping, or other bank stabilization measures and culvert installations are usually forestry-related projects subject to **Stream Channel Protection Act** permits.
- The joint application requires information including the location, description, and project plans. The evaluation may include an on-site review. Larger, more complex projects may require more than 60 days before IDWR can issue or deny a permit.



Concrete planks, fastened together and stretched across the stream bed, provide an improved ford crossing. Approximate cost: $100 per running foot, installed.

Limited traffic on this improved ford crossing has minimal impact on the stream bed and on sediment production.

Streams can be crossed with culverts, bridges or fords. Culverts are the most common stream crossing structure. Bridges are best for large streams and areas plagued with floatable debris problems. Bridges also have less effect on fisheries than other methods. Fords are often less desirable because of continued disturbance to the stream bed. Choice of the stream crossing method depends on the following:

Stream size

Cost of construction and maintenance

Amount of road use and years of use

How the road approach lies with respect to the stream

Soil foundation conditions

Available equipment and materials

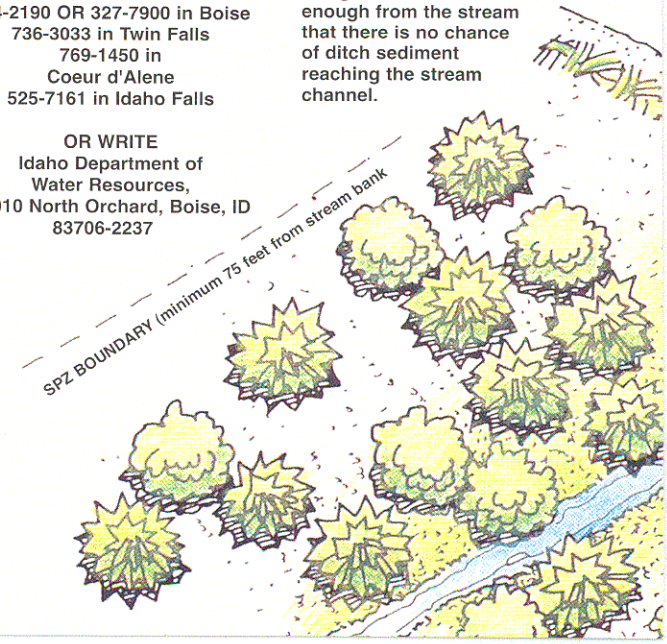
Permit requirements

A wrong choice of stream crossing method can result in major damage to both the immediate site and down-stream water uses. That is why strict forest practice requirements govern stream crossings. In addition, all landowners considering temporary or permanent stream crossings on perennial streams must obtain a stream channel alteration permit from the IDWR.

CALL
334-2190 OR 327-7900 in Boise
736-3033 in Twin Falls
769-1450 in
Coeur d'Alene
525-7161 in Idaho Falls

OR WRITE
Idaho Department of
Water Resources,
13010 North Orchard, Boise, ID
83706-2237

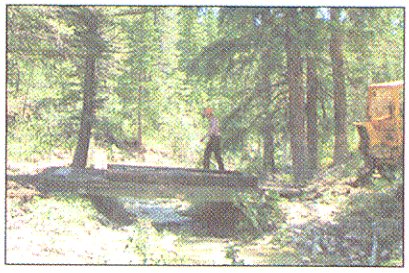
Never allow a ditch to drain into a stream. Drain road ditches into a vegetated area far enough from the stream that there is no chance of ditch sediment reaching the stream channel.

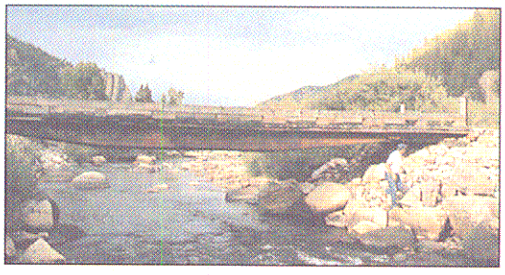


Design Considerations

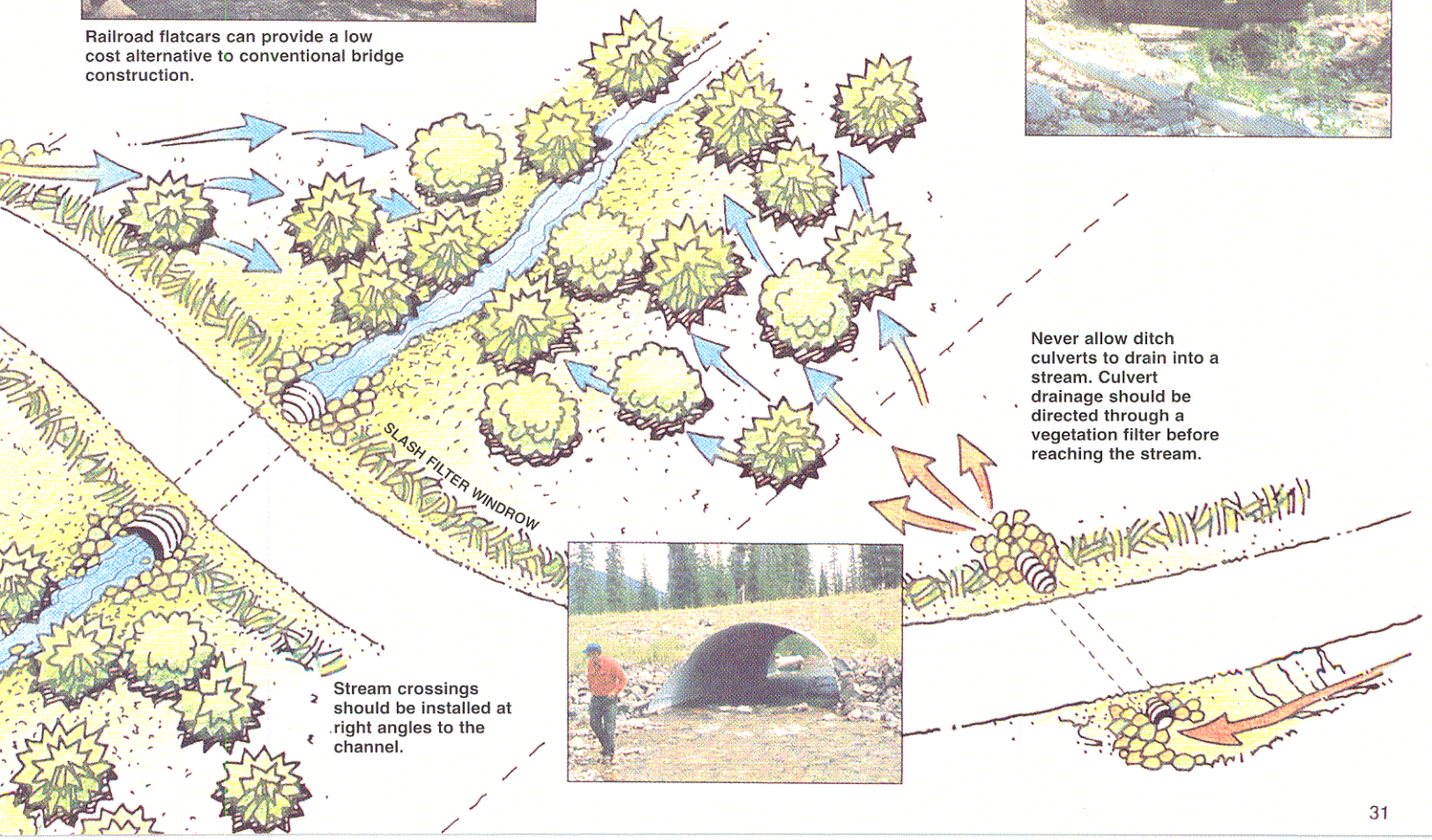
- Design all stream crossings to handle 50-year peak flows. For culverts up to 6 feet in diameter, use culvert sizing tables I and II in FPA rule 040.02.i., and vi and vii, FPA.
- FPA requires permanent culverts to be 18 inches or larger, except in the upper Snake River Basin, where a 15-inch minimum is allowed.
- Culverts larger than 6 feet in diameter must be designed by a person trained in stream hydrology. Consider alternative structures, such as bridges or ford.
- Relief culverts and those used for seeps, springs, wet areas, and draws must not be less than 12 inches in diameter for permanent use.
- All culverts planned for Class I streams must allow for fish passage.

When short-term access to forest land is cut off by a stream, portable bridges are one solution. They offer the flexibility of convenience and low cost. A timber harvest or other forest activity can be carried out over a short period of time and the crossing easily restored to its original condition. This railroad car portable bridge provided access to an eight-acre sale. An appropriate crossing, approximately 10 feet wide, with firm soil banks, level grade, and requiring minimal vegetation clearing, was selected. The 20-foot-long bridge was hauled into place with a flatbed truck, stretched across the stream, and set into place in one day. Cribbing for the bridge consisted of 10-foot-long timbers laid on the ground approximately 4 feet away from the bank. A small crawler tractor finished the installation by building the road approaches to the bridge. This durable bridge crossing was used over a 3-week period. Approximately 25 80,000-pound log truckloads were hauled across it. When the harvest was completed, all logging and skid trail roads were restored and the temporary bridge stabilized. Regardless of whether temporary or permanent, any stream crossing requires a stream channel alteration permit.





Railroad flatcars can provide a low cost alternative to conventional bridge construction.



Never allow ditch culverts to drain into a stream. Culvert drainage should be directed through a vegetation filter before reaching the stream.

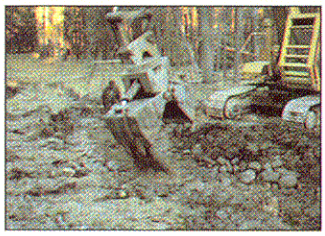
Stream crossings should be installed at right angles to the channel.

Installation of Stream Crossings

NOTE: Stream Channel Alteration Permit required.

- Minimize stream channel disturbances and related sediment problems during road construction and stream crossing structure installation.
- Time construction activities to protect fisheries and water quality.
- Do not place erodible material into stream channels. Remove stockpiled material from high water zones.
- Locate temporary construction bypass roads in locations where the stream course will have minimal disturbance.
- When using culverts to cross small streams, install those culverts to conform to the natural stream bed and slope on all perennial streams and on intermittent streams that support fish or that provide seasonal fish passage.
- Place culverts slightly below normal stream grade to avoid culvert outfall barriers. Do not alter stream channels upstream from culverts, unless necessary to protect fill or to prevent culvert blockage.
- Install culverts to prevent erosion of fill. Compact the fill material to prevent seepage and failure. Armor the inlet and/or outlet with rock or other suitable material where needed.
- Consider dewatering stream crossing sites during culvert installation.
- Use 1 foot minimum cover for culverts 18 to 36 inches in diameter, and a cover of one-third diameter for larger culverts to prevent crushing by traffic.

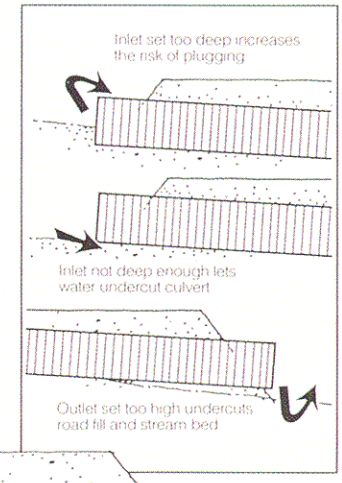
Construction of stream crossings has the greatest potential to cause immediate sediment pollution. Complete the work as fast as possible during a time of year when the least damage can occur. This photo sequence shows a typical culvert installation.



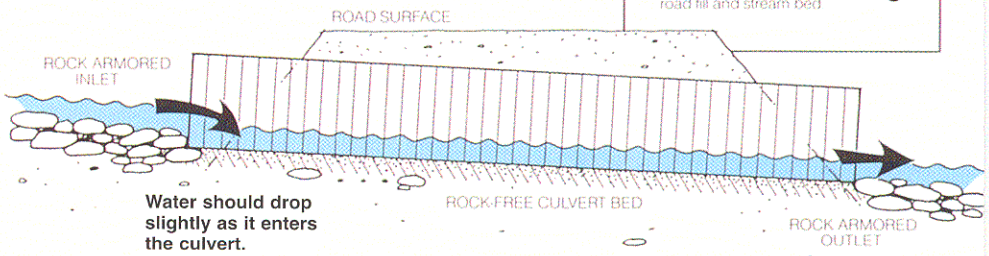
The temporary channel in the foreground carries stream water. The dewatered stream channel is being cleared for the culvert foundation and trench walls must be free of logs, stumps, limbs, or rocks that could damage the pipe.

The culvert bed is graded to the appropriate slope to conform with the natural stream bed. The bed is either rock-free soil or gravel. Bedding should provide even distribution of the load over the length of the pipe.

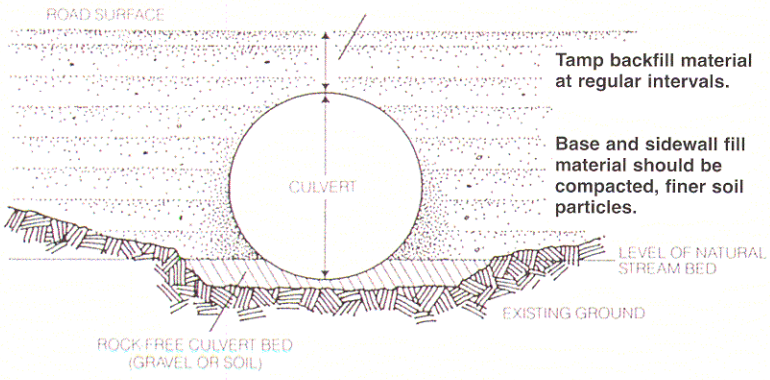
Alignment is critical for the culvert to function properly. Culverts set at an angle to the channel can cause bank erosion. Skewed culverts can develop debris problems. Culvert alignment must fit the natural stream channel.



Place culvert slightly below the natural stream bed. Water should drop slightly as it enters the culvert. The natural rock bed of this stream serves to control water velocity and protect the culvert as water enters the inlet.

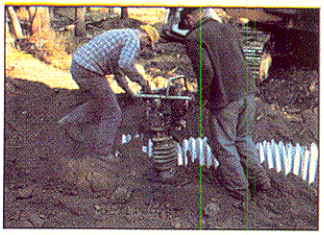


At least one foot of cover or one-third of diameter for larger culverts.



Start to backfill over one end of the culvert. Then cover the other end. Backfill material must be free of limbs, rocks, and other debris that could dent the pipe or allow water to seep around the culvert.

Once the ends are secured by backfill, the center is covered. Pour backfill material over the top of the pipe. This allows finer soil particles to flow around under culvert sides. Larger particles roll to the outside. Fine soil particles close to the culvert compact more easily.



Tamping fill material throughout the entire backfill process is important. The base and sidewall material should be compacted first. This reduces seepage into the fill.

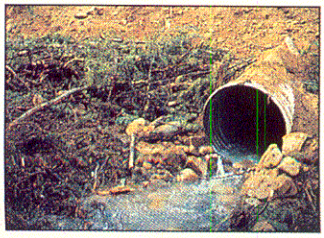
Both the culvert inlet and outlet should be armored. Rocks, logs, or grass seeding can be used to protect these locations against erosion.

When the new culvert is opened to water, watch for the need to add more rock armor. Be sure that a minimum of one foot of compacted soil covers the top of the culvert.

After checking to be sure the new culvert is working, the dewatering channel is closed.

Road approaches to the new crossing are the next phase of construction.

Layers of fill are pushed into place and carefully compacted to build up and maintain a consistent road grade.



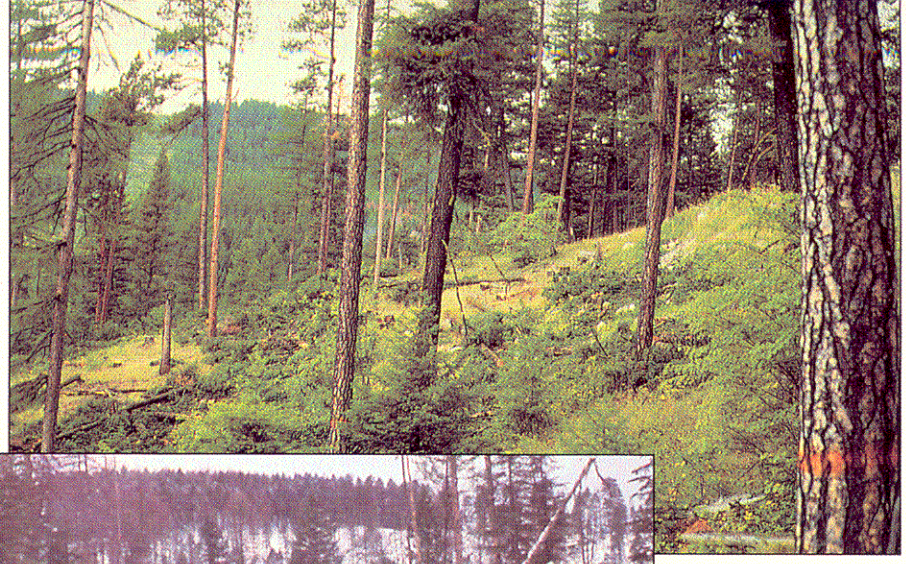
As a final precaution against sediment entering the stream, a slash filter windrow is constructed around the culvert outlet.

The need to safeguard the future of our water resource is essential. With the cooperation of all forest users, and the application of the information on these pages, we can protect the water quality of Idaho's forest lands.

Please be aware the BMP's can and probably will change. Our knowledge of the forest will increase over time. Forest managers will have new techniques, new equipment, and different needs. To help you keep up to date with BMP changes, Idaho's BMP education program includes workshops, videos, and literature. You are encouraged to participate in this program.

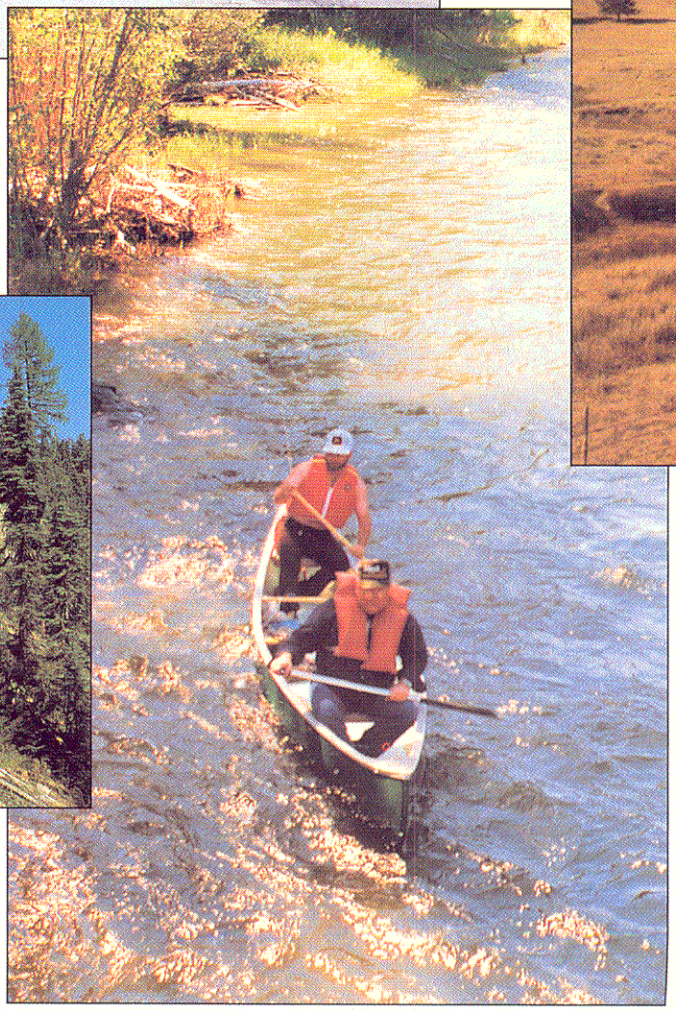
Thank you for doing your best to put BMP's to work in the forest.

IDAHO
FOREST PRODUCTS
Commission



IDAHO DEPARTMENT OF LANDS

University of Idaho
Cooperative
Extension System



FOREST SERVICE
U S
DEPARTMENT OF AGRICULTURE

FOREST
STEWARDSHIP